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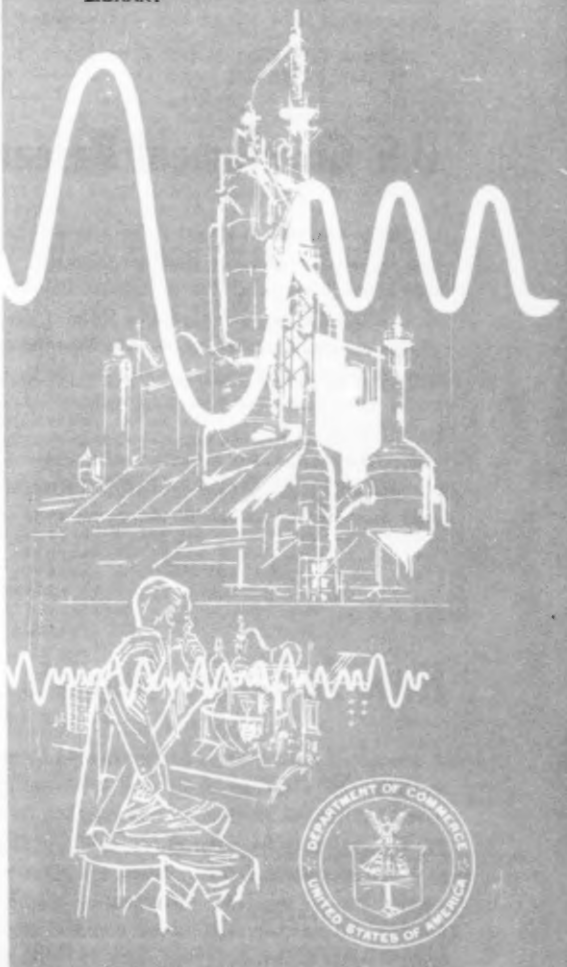

U. S. DEPARTMENT OF COMMERCE
BUSINESS AND DEFENSE SERVICES ADMINISTRATION
Office of Technical Services

U.S. GOVERNMENT RESEARCH REPORTS

U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

BUSINESS AND DEFENSE SERVICES ADMINISTRATION

Office of Technical Services
John C. Green, *Director*

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U.S. Government Research Reports

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TECHNICAL ABSTRACT BULLETIN

1. AIRCRAFT AND FLIGHT EQUIPMENT

AD-255 123 Div. 1, 33
(2 May 61) OTS price $1.10

Army Arctic Test Board, Fort Greely, Alaska.
SERVICE TEST OF YAC-1DH AIRCRAFT FOR PARACHUTE DELIVERY OF PERSONNEL, SUPPLIES, AND EQUIPMENT.
3 Apr 61. 8p. (Proj. ATB 3-121)
Unclassified report

DESCRIPTORS: Aircraft, Tests, *Air drop operations, Parachutes, Cargo, Personnel, Arctic regions, *Transport planes, Transportation, Air transportation, Military transportation.

Tests were made to determine the suitability for Army use of the YAC-1DH aircraft for parachute delivery of personnel, supplies, and equipment under arctic winter conditions, and to determine the suitability of temperate zone techniques for parachute delivery of personnel, supplies and equipment under arctic winter conditions. It was concluded that the YAC-1DH Aircraft will be suitable for Army use under arctic winter conditions for parachute delivery of personnel, supplies, and equipment when modified to correct the discrepancies. The parachute procedures and techniques developed for use in temperate climates with the test aircraft are suitable for Army use under arctic winter conditions. The factory modification of the cargo compartment tiedown grid provided adequate restraint for aircraft loads. A lesser number of the types and number of tiedowns than those found on the test aircraft would result in insufficient tiedowns. (Author)

AD-255 192 Div. 1
(3 May 61) OTS price $1.75

National Aeronautics and Space Administration, Washington, D. C.
SKID LANDINGS OF AIRPLANES ON ROCKER-TYPE FUSELAGES,
by Wilbur L. Mayo. May 61, 61p. incl. illus. tables (Technical note D-760)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-760.

DESCRIPTORS: *Airplanes, *Landing, Pitch, Model tests, *Fuselages, *Airplane noses, *Tails, Landing impact, Experimental data, Stability, Tests, Design, Aerodynamics, Damping, Load distribution, Moments, Oscillation, Airplane landings, Differential equations.

A study is made of rocking on a curved fuselage undersurface, following impact of the tail or nose, to convert vertical energy in landing into the energy of a pitching oscillation in which wing lift changes and aerodynamic damping are important. Computations of the load and motions for particular shapes, and shapes for particular load applications, are made for selected airplanes. A dynamic model of one of these airplanes was tested to check the computations for impact and to provide additional information relative to the stability of the landing runout. Analysis and experiment indicate that loads and moments are acceptable. (Author)

AD-255 198 Div. 1
(3 May 61) OTS price $0.50

National Aeronautics and Space Administration, Washington, D. C.
EFFECTS OF GYROSCOPIC CROSS COUPLING BETWEEN PITCH AND ROLL ON THE HANDLING QUALITIES OF VTOL AIRCRAFT,
by John F. Garren, Jr. Apr 61, 20p. incl. illus. tables. (Technical note D-812)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-812.

DESCRIPTORS: *Vertical take-off planes, Design, Damping, Moments, Handling, Control, Pitch, Roll, Instrument landings, *Helicopters, Flight testing, Jet engines, Stability (Lateral), *Aerodynamics, Simulation, *Jet planes, Maneuverability.

An experimental and theoretical investigation indicates the extent to which the amount of cross coupling present in an aircraft is dependent on the angular-velocity damping and moments of inertia of the aircraft as well as the angular momentum of the engine. The amount of cross coupling which the pilot can tolerate is a function of the maneuvers encountered and the aircraft control power. A criterion based on pilots' opinions obtained from the simulation flights provides a means for determining the acceptability of cross coupling in VTOL aircraft as a function of the aircraft design parameters. (Author)

AD-255 257 Div. 1, 5
(4 May 61) OTS price $3.60

Operational Support Engineering Div., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
FULL-SCALE AERIAL DEPLOYMENT OF RADIO BEACON AN/ART-32(XA-1),
by S. L. Stutz. Rept. on Airborne Crash Locator Equipment. Mar 61, 25p. incl. illus.
(Proj. no. 4373)
(WADD TR 60-903) Unclassified report

DESCRIPTORS: *Radio beacons, Radio homing, Automatic, *Aviation accidents, Radio equipment, Radio navigation, Radio signals, *Direction finding, Direction finding signals, Tests, Pneumatic devices, Test methods, *Radio transmitters, Flotation, Parachutes, Reliability, *Air sea rescue beacons.

Radio beacon AN/ART-32(XA-1) was developed to alert and guide search and rescue parties, both on the ground (sea) and in the air, to the crash location. The radio beacon, by radio signal, indicates that the crash has occurred and, by a continuing radio signal, serves as a directional guide that will lead searchers to rendezvous at the crash site. The beacon is automatically catapulted and deployed from the air or from the ground. Inertial switches located within the aircraft carrying the beacon react to catapult the beacon from the aircraft upon impact with the earth or other objects. Results are presented of a series of parachute drop tests and one ground launching to produce automatic deployment for use in case of airplane crash. Various aspects of the complete equipment required for the deployment cycle performed satisfactorily, however, some of the equipment failed due to certain natural limitations, design deficiencies, and packaging and shipping methods. (Author)

AD-255 410 Div. 1
(4 May 61) OTS price $1.60.

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
VERTICAL TAKE-OFF AIRCRAFT,
by L. Gil'berg. 26 Oct 60, 11p. incl. illus.
(Trans. no. MCL-701 from Znaniye Sila 4:34-36, 1960)
Unclassified report

DESCRIPTORS: *Vertical take-off planes, USSR, *Jet planes, Design, Take-off, Landing, Airplane landings, *Aeronautics, Helicopters,

AD-255 460 Div. 1, 13
(8 May 61) OTS price $2.60

National Aviation Facilities Experimental Center, Atlantic City, N. J.
EVALUATION OF A FLAME SURVEILLANCE-TYPE DETECTOR,
by Marvin F. Rammelsburg and Paul R. Dierdorf.
Final rept. Apr 60, 11p. illus.
Unclassified report

DESCRIPTORS: *Fire detectors, *Fire alarm systems, *Aircraft fires, Detection, Sensitivity, Flames, Jet engine nacelles, Jet engines, Jet planes, Power plants, Fires, Jet engine fuels, Light, Design, Test facilities, Test methods, Photoelectric cells, Infrared photoelectric cells, Detectors, Airframes, Airborne.

A surveillance-type flame detector system of the Pyrotector design was evaluated in laboratory bench-type tests and by exposing the units to more than 250 small-magnitude JP-4 test fires in a modified KC-135 nacelle which had a comparatively low internal airflow. Laboratory bench testing showed the detector's sensitivity decreased as the ambient light increased. In the KC-135 powerplant tests, the system detected 93 per cent of all fires to which it was exposed. It functioned satisfactorily under several engine power conditions and had a consistently short response time. (Author)

AD-255 537 Div. 1, 12
(7 May 61) OTS price $8.10

Northrop Aircraft, Inc., Hawthorne, Calif.
F-101A TOW SUBSYSTEM SYSTEM TESTS. F-101A AIRPLANE. PART II,
by M. L. Green. 15 Nov 60, Apr 61, 74p. incl. illus. (Rept. no. NOR-60-86)
(Contract AF 08(635)472)
(WADD TR 61-204) Unclassified report

DESCRIPTORS: *Aerial targets, Flight testing, *Towing planes, Reels, Launching, Recovery, Instrumentation, Jet fighters, Jet planes, Towed bodies, Airborne, Tests, Supersonic flight, Reliability, Maintenance, Drag, Control systems, Automatic.

Results are presented of the flight test program conducted on the F-101A tow subsystem. Two NF-101A aircraft were modified to the test configuration and were used throughout the test program. One of these was chosen as the basic test article and was instrumented to provide quantitative test data. (Author)

AD-255 752 Div. 1, 9
(11 May 61) OTS price $2.60

Flight Dynamics Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
MANEUVER LOAD DATA FROM C-130 AIRCRAFT,
by Lawrence Phillips. Rept. for Structural Design Criteria. Mar 61, 17p. incl. illus. tables.
(Proj. 1367)
(WADD TN 61-44) Unclassified report

DESCRIPTORS: Maneuverability, *Transport planes, Flight testing, Structures, Load distribution, Fatigue (Mechanics), Design.

Structural flight load data are presented from C-130A and B aircraft performing normal operations and analyses of the data. This information is intended for use in determining design criteria for future flight vehicles and in estimating the effect of these missions on a structure of this type in terms of structural fatigue and estimated life. (Author)

AD-255 918 Div. 1
(15 May 61) OTS price $2.60

Beech Aircraft Corp., Wichita, Kans.
PROTOTYPE DEVELOPMENT MODEL 385 AIR REFUELING STORE,
by C. V. Lassmann. Interim rept. no. 10, 1-31 Mar 61. 7 Apr 61, 17p. incl. illus. (Engineering rept. no. 4106)
(Contract NOw 60-0060-c)
Unclassified report

DESCRIPTORS: *Refueling in flight, Booms, Aircraft, Airplane protuberances, Flight testing, Aircraft equipment, Design, Towed bodies, Bombers.

Satisfactory progress was achieved in the continued development of the Beech model 385 air refueling store. Several flight tests were performed on the experimental store, including operational cycles, receiver contacts and flutter checks. Excellent characteristics were indicated regarding mechanical function, drogue stability, formating position and coupling. The store has insufficient response power at low airspeeds, and is presently being modified to obtain improvements in this area. There is also an indication of boom flutter at speeds

above 220 KEAS, and a maximum operational speed limitation of 210 knots was tentatively established. Flight testing is expected to be continued pending completion and checkout of the store modification. In addition to the flight test program, work was continued on the compatibility analysis and on prototype store design. (Author)

AD-255 927 Div. 1
(12 May 61) OTS price $1.60

Air Force Flight Test Center, Edwards Air Force Base, Calif.
EVALUATION OF THE VERTOL STABILITY AUGMENTATION SYSTEM AND DIFFERENTIAL DELTA-3 IN AN H-21D,
by V. Keith Putnam and Robert G. Ferry. May 59, 11p. incl. illus. (Rept. no. AFFTC TN 59-3)
Unclassified report

DESCRIPTORS: *Helicopters, Helicopter blades, Control systems, *Stability (Longitudinal), *Stability (Lateral), Damping, Helicopter rotors, Rotor blades, Pitch, Roll, Yaw, Flight testing, Gyroscopes, *Stabilization.

An H-21D helicopter with the Vertol stability augmentation system (SAS) and differential-delta-three was evaluated. The differential-delta-three was found to provide acceptable longitudinal dynamic stability and allow hands-off flight (longitudinally) for periods of up to 1 minute. The longitudinal channel of the SAS also provided positive longitudinal stability and allowed hands-off flight for periods of at least 1 minute. With the SAS operating, the response to a longitudinal disturbance was (jerky) and was considered objectionable in rough air. It must be noted that the differential-delta-three was operating at all times and therefore a double correction for longitudinal disturbances was present with the SAS operating. The lateral stability provided by the SAS was considered excellent. However, the reduction in lateral control response and the nature of the response (a 1 inch step input results in a fixed bank angle and does not maintain a roll rate) with SAS operating were objectionable. The SAS did not improve directional flying qualities, and some loss of directional control response was noted in hover. (Author)

AD-255 957 Div. 1, 9
(15 May 61) OTS price $ .50

National Aeronautics and Space Administration, Washington, D. C.
UNSTEADY MOTION OF A WING OF FINITE SPAN IN A COMPRESSIBLE MEDIUM,
by E. A. Krasilshchikova. May 61, 19p. incl. illus. (Technical trans. no. F-58 from Izvestiya Akademii Nauk, Otdelenie Tekhnicheskikh Nauk SSSR (Moscow) pp. 25-31, Mar 58)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical trans. no. F-58.

DESCRIPTORS: *Wings, Supersonic flow, USSR, *Aerodynamics, Moments, Velocity, Integrals, Mathematical analysis, Supersonics.

The linearized boundary value problem for the velocity potential for steady or unsteady finite wings in a compressible medium is formulated. The general equation for the velocity potential is given in the form of integrals of source distributions. The local source strength, determined in previous investigations (for example, in NACA TN-1383 AD 107 582), is proportional to local downwash, but the region that must be covered by sources, as well as the domain of integration, must extend over all points of the xy-plane from which disturbances can affect the potential. (Author)

2. ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-255 055 Div. 2, 25
(2 May 61) OTS price $5.60

Army Electronic Proving Ground, Fort Huachuca, Ariz.
RESEARCH STUDY. SPECIAL CASES OF SIMULATING THE ENERGY BUDGET OF THE EARTH/AIR INTERFACE, by J. F. Appleby and Lane Fujikado. Oct 60, 162p. incl. illus. tables (Rept. no. AEPG-SIG 970-30; Micrometeorological research notes no. 1)
Unclassified report

DESCRIPTORS: *Earth, *Atmosphere, Surface area, Meteorology, *Micrometeorology, *Heat transfer, Thermal radiation, Soils, Heat, Analog computers, Water vapor, Convection, Evaporation, Simulation.

A model of the heat budget of the earth/air interface was mechanized on a PACE 31R electronic analog computer. For comparative purposes two test cases were run for each of the seven general observation periods. Case I used constants which assumed the non-unity of the ratio of eddy diffusivities for heat and water vapor while Case II used constants which assumed their ratio to be one. For both cases, changing boundary conditions with time were generated by function generators. The results of the test are presented in a series of graphs which show comparisons of the simulated and observed variables plotted against solar time. Variables compared are the heat fluxes of net radiation, convection, evaporation, and soil heat conduction; the air temperature at 160 cm above the ground; the soil temperature at 5 cm below the ground surface; the air temperature gradient between elevations above the ground of 400 and 50 cm; and the wind speed at 160 cm above the ground. Simulated values were generally in good agreement with observed values. Case II more closely approximated observed values than Case I. Biased results were frequently observed in both cases with the direction of the bias tending toward the greater values. (Author)

AD-255 056 Div. 2
(2 May 61) OTS price $12.00

McGill U. (Canada).
A DYNAMICAL STUDY OF THE 1958-59 STRATOSPHERIC POLAR VORTEX,
by B. W. Boville. Feb 61, 134p. incl. illus. tables (Arctic Meteorology Research Group Publication in Meteorology no. 36; Scientific rept. no. 9)
(Contract AF 19(604)3865)
(AFCRL-214) Unclassified report

DESCRIPTORS: Atmosphere, *Stratosphere, Arctic regions, *Meteorology, Meteorological charts, Statistical analysis, Fourier analysis.

The circulation of the stratosphere and its relation to the troposphere is presented for the six-month period October, 1958 to March, 1959. The study is based mainly on circumpolar analyses at five-day intervals at the 500-mb, 100-mb and 25-mb levels, supported by numerous space and time sections. Fourier analysis of the circumpolar charts is used to compute energies and energy exchanges after the manner of Lorenz (Tellus, 7:157-167, 1955) and unstable wave characteristics following the linear theory of Fleagle (Quart. J. R. Meteor. Soc., 83:1-20, 1957). The polar-night middle stratosphere is found to be baroclinically unstable in mid-winter, otherwise the energy exchanges appear to be ascribable to forced perturbations. (Author)

AD-255 065 Div. 2
(2 May 61) OTS price $1.10

High Altitude Observatory, Boulder, Colo.
GEOMAGNETIC STORMS AND THE SPACE AROUND THE EARTH,
by Sydney Chapman. 4 Apr 61, 8p. (Scientific rept. no. 29)
(Contract AF 19(604)2140)
(AFCRL-289) Unclassified report

Reprint from Nature 187:824-827, 3 Sep 1960.
(Copies also available from ASTIA)

DESCRIPTORS: *Terrestrial magnetism, *Magnetic storms, Geophysics, Atmosphere, Exosphere, Ionosphere, Solar disturbances, Aurorae.

AD-255 067 Div. 2
(2 May 61) OTS price $1.60

High Altitude Observatory, Boulder, Colo.
THE EXTENDED SOLAR CORONA,
by Sydney Chapman. 4 Apr 61. 10p. (Scientific rept. no. 31)
(Contract AF 19(604)2140; In cooperation with Geophysical Inst., U. of Alaska)
(AFCRL-292) Unclassified report

DESCRIPTORS: *Solar corona, Planetary atmospheres, Stars, Planets, Sun, Solar atmosphere, Gases, *Interstellar matter.

AD-255 068 Div. 2
(2 May 61) OTS price $1.10

High Altitude Observatory, Boulder, Colo.
IONIZATION ABOVE THE F2-PEAK AS AFFECTED BY THE INTERPLANETARY GAS,
by Sydney Chapman. 4 Apr 61. 8p. (Scientific rept. no. 33)
(Contract AF 19(604)2140; In cooperation with Geophysical Inst., U. of Alaska)
(AFCRL-294) Unclassified report

DESCRIPTORS: *Interstellar matter, *Solar atmosphere, Hydrogen, Stars, Earth, Gas ionization, Ionosphere.

The atmospheres of the earth, the sun and other bodies are surrounded by gas that is nearly uniform in number density n and kinetic temperature T, over spaces much greater than those occupied by the atmospheres. This gas may be called the ambium of the atmosphere. In total it is much more massive than the atmosphere it encloses. The conditions in the ambium must powerfully affect the state of the outer atmosphere. In particular, there must be a continuous transition of the values of n and T between the ambium and the atmosphere. In the case of the earth, the sun and other hot stars, both the ambium and

the outermost part of the atmosphere will consist of atomic hydrogen. The temperature of the ambium will determine whether this hydrogen and that of the outermost atmosphere are mainly ionized or neutral. Evidence is presented favoring the view that the earth's ambium consists of ionized solar atmospheric hydrogen. Thus, the outermost part of the earth's atmosphere is likewise hot and ionized. It must enclose an extensive layer of mainly neutral atomic hydrogen. (Author)

AD-255 069 Div. 2, 25
(2 May 61) OTS price $5.60

High Altitude Observatory, Boulder, Colo.
THE AVERAGE MORPHOLOGY OF GEOMAGNETIC STORMS WITH SUDDEN COMMENCEMENT,
by Masahisa Sugiura and Sydney Chapman. 4 Apr 61, 53p. incl. illus. tables (Scientific rept. no. 32)
(Contract AF 19(604)2140; In cooperation with Geophysical Inst., U. of Alaska, College)
(AFCRL-293) Unclassified report

Reprint from Abhandlungen. Der Akademie der Wissenschaften in Gottingen Mathematisch-Physikalische Klasse 4:1960. (Copies also available from ASTIA)

DESCRIPTORS: *Geophysics, *Magnetic storms, Terrestrial magnetism, *Meteorological data, Spectrographic data, Statistical analysis, Numerical methods and procedures, Diurnal variation.

The average morphology is described of geomagnetic storms with sudden commencement. A numerical intensity index was assigned to each of 346 storms occurring in 1902--45. On the basis of these indices the storms were divided into three sets, of 136 weak, 136 moderate, and 74 great storms. Their morphology was studied separately. For weak storms records were analyzed from 26 magnetic observatories, ranging in geomagnetic latitude from 80 deg N to 48 deg S; and for moderate and great storms, from 19 observatories, 80 deg N to 1 deg S. The storm-time variation Dst and the disturbance longitudinal inequality DS were determined for the first three storm days for different latitudes. The DS variation was obtained, and harmonically analyzed, for each of the first 8 quarter-day intervals and for the succeeding three 8-hour intervals. New features of storm morphology during the first few hours of storm time were discovered: namely, that DS reaches its maximum in about two or three hours from the storm commencement, and that its phase rapidly changes during the first few storm hours. (Author)

AD-255 073 Div. 2
(3 May 61) OTS price $8.60

Wisconsin U., Madison.
FLIGHT INVESTIGATIONS OF SURFACE ALBEDO. A REGIONAL STUDY OF SOUTH CENTRAL WISCONSIN 1959-1960,
by Kenneth G. Bauer and John A. Dutton. Sep 60, 1v. incl. illus. tables (Technical rept. no. 2)
(Contract DA 36-039-sc-80282)
Unclassified report

DESCRIPTORS: Wisconsin, Solar energy, Earth, Reflection, Surface properties, *Atmosphere, *Micrometeorology, *Meteorological instruments, Airborne, Albedo (Astronomy), Airplanes, Measurement, Turbulence, Diurnal variations, Instrumentation, Terrain, Research planes, Data processing systems, Clouds.

The suitability of a light airplane as a micrometeorological probe was demonstrated. In addition to the micrometeorological data obtained, valuable experience was gained in airplane and instrument operation, flight techniques for low level observations, the adaptation of meteorological sensors to airborne probing, and in many other related subjects. The effects of various weather elements on the measurement of albedo were evaluated. Attempts to obtain valid albedo measurements under partly cloudy conditions met with little success. The effect of turbulence was also investigated. The study of cloud albedo and the absorption of radiation by clouds was shown to be practical for airplane probing. (Author)

AD-255 076 Div. 2
(3 May 61) OTS price $2.60.

California Academy of Sciences, San Francisco.
OIL SEEPAGES ON THE ARCTIC COASTAL PLAIN, ALASKA,
by G. Dallas Hanna. 1961, 28p. incl. illus. 28 refs.
(Subcontract to Arctic Inst. of North America, Contract Nonr-113800)
Unclassified report

DESCRIPTORS: *Alaska, Arctic regions, *Geology, History, *Petroleum, Oils, Mineral oils, Hydrocarbons,

AD-255 089 Div. 2
(2 May 61) OTS price $1.60

Indiana U., Bloomington.
COMMERCIAL GEOGRAPHY OF ST. LUCIA,
by Otis P. Starkey. Feb 61, 15p. incl. illus. tables (Technical rept. no. 8)
(Contract Nonr-90813, Proj. NR 388-051)
Unclassified report

DESCRIPTORS: *Geography, *Economic conditions, Climatic factors, Climate, Caribbean Islands.

AD-255 146 Div. 2
(4 May 61) OTS price $0.50

Brookhaven National Lab., Upton, N. Y.
A STUDY OF THE WIND PROFILE IN THE LOWEST 400 FEET OF THE ATMOSPHERE,
by Irving A. Singer and Constance M. Nagle. Progress rept. no. 7, 16 May-15 Sep 60. Sep 60, 20p. incl. illus. tables (Rept. no. BNL 635 (T-198))
(Proj. no. 3A99-07-001-03)
Unclassified report

DESCRIPTORS: *Wind, *Micrometeorology, Measurement, Atmosphere models, Wind tunnels, Data processing systems, Tests, Tables.

The predictability is discussed of wind speed from the wind speed at a lower reference level by using an unweighted predictor of varying average length and relative displacement in time. Two models were tested and compared to the best possible linear predictor: a simple model and a mean

model. Four different gustiness conditions were analyzed to show the effects of lagging the reference level by 0, 30, 60, 90, and 120 sec and increasing its averaging length by factors of 1, 2, and 4. The predicted averaging lengths studied were 3, 12, 30, 60, and 180 sec. It is assumed in using the predictor models that the average wind speeds are known or can be estimated. Therefore, the ability to predict the hourly average wind speeds at 355 ft from the 37-ft level for a 2-mo period by using a power law relationship was also tested. Preliminary results are presented. (Author)

AD-255 168 Div. 2, 15
(1 May 61) OTS price $1.10

Weizmann Inst. (Israel).
THEORY OF OCEAN TIDES.
Quarterly rept. no. 22, Jan-Mar 61. 15 Apr 61. 3p. incl. illus.
(Contract Nonr-182300)
Unclassified report

DESCRIPTORS: *Ocean waves, *Oceans, *Tides, Equations, Solutions.

AD-255 214 Div. 2
(3 May 61) OTS price $15.50

McGill U. (Canada).
A SYNOPTIC CLIMATOLOGY FOR PARTS OF THE WESTERN CORDILLERA,
by Edward R. Walker. Feb 61, 218p. incl. illus. tables, 113 refs. (Arctic Meteorology Research Group Publication in Meteorology no. 35; Scientific rept. no. 8)
(Contract AF 19(604)3865)
(AFCRL-213) Unclassified report

DESCRIPTORS: Mountains, Canada, British Columbia, *Meteorology, *Precipitation, Atmosphere, Statistical distributions, Meteorological charts, *Weather forecasting.

Effects of mountain terrain, the Canadian Cordillera, on distributions of precipitation and temperature were studied. Techniques from several fields of meteorology were blended with modern data processing in an attempt to overcome the sparseness and non-representativeness of weather observations. Atmospheric characteristics over British Columbia were found to be sharply differentiated by the direction of the flow at the 700 millibar level. Linearized two-dimensional mountain airflow theory was combined with relevant atmospheric characteristics to derive simple models of precipitation distributions over mountain ranges. These models were used to supplement observations to obtain improved charts of precipitation over the southern half of British Columbia. Altitudinal variation, and other characteristics of the distributions of precipitation and temperature not hitherto available were elucidated. The relationships obtained between atmospheric characteristics and observed weather suggest that it may be practicable and economical to observe the climate of sparsely settled mountainous areas using relatively few weather stations. (Author)

AD-255 229 Div. 2
(3 May 61) OTS price $3.60

New York U. Coll. of Engineering, N. Y.
PRELIMINARY ANALYSIS OF WIND VARIABILITY AT HIGH ALTITUDES,
by Griffith Morgan, Jr. and Alvan Bruch. Scientific rept. no. 750-01 on Wind Variability. Feb 61, 35p. incl. tables. (Scientific rept. no. 750-01)
(Contract AF 19(604)6193)
(AFCRL-264) Unclassified report

DESCRIPTORS: *Upper atmosphere, *Wind, *Stratosphere, Measurement, Meteorological data, *Sounding rockets, Radar confusion reflectors, Parachutes.

A meteorological rocket network organization completed its first year of routine wind measurement in the upper atmosphere and mesosphere. Using Loki I and II and the Arcas as primary rocket systems to deliver chaff and metallized nylon parachutes, it has attempted to establish a routine program of obtaining wind measurements once daily during each of the four mid-season months at seven North American missile ranges. (Author)

AD-255 289 Div. 2, 1, 4, 26
(4 May 61) OTS price $2.60

Metal Hydrides, Inc., Beverly, Mass.
HYDROGEN GENERATION FOR HIGH ALTITUDE BALLOONS,
by Charles H. Lewis, David W. Rudd, and Edward A. Sullivan. Quarterly progress rept. no. 3, 15 Dec 60-14 Mar 61. 14 Mar 61, 22p. incl. illus. tables.
(Contract DA 36-039-sc-84931, Proj. 3D36-03-001-01)
Unclassified report

DESCRIPTORS: *Gas generating systems, Tests, Sodium compounds, Borohydrides, Chlorides, Cobalt compounds, Boron compounds, Borides, *Hydrogen, Production, Catalysis, Design, Catalysts, Lithium compounds, *Balloons, Aluminum compounds, High altitude, *Meteorological balloons.

Hydrogen generation from sodium borohydride, catalyzed by either cobalt chloride, or cobalt boride supported on inert porous surfaces, has been tested on 1, 6, 21 and 42 cu ft scales. Smooth, efficient generation of 42 cu ft within thirty minutes has not yet been achieved. Foaming of the reaction solution complicates the system. (Author)

AD-255 345 Div. 2, 30
(5 May 61) OTS price $2.60

Texas A. and M. Research Foundation, College Station.
IMPROVEMENT, EVALUATION, AND EXTENSION OF CAPABILITIES OF METEOROLOGICAL SIMULATION (DALLAS TOWER PROGRAM),
by William H. Clayton. Quarterly rept. no. 2, 16 Sep-15 Dec 60. Jan 61, 24p.
(Contract DA 36-039-sc-84942)
(Ref. no. 60-23T) Unclassified report

DESCRIPTORS: *Weather forecasting, Texas, Meteorological data, Simulation, Weather stations, Instrumentation, Analog computers, *Meteorological instruments.

Contents:
Activities during the second quarter
Instrumentation (secondary stations)
Instrumentation (main stations)
Review of general purpose analog computer study
Miscellaneous
Conclusions

AD-255 348 Div. 2
(9 May 61) OTS price $12.50

Hawaii Inst. of Geophysics, Honolulu.
NOTES ON THE METEOROLOGY OF THE TROPICAL PACIFIC AND SOUTHEAST ASIA,
ed. by C. S. Ramage. Interim rept. on The Practical Aspect of Tropical Meteorology. June 60, 141p. incl. illus. tables (Air force surveys in geophysics rept. no. 126; AFCRC TN 60-455, Supersedes AD-235 212)
(Contract AF 19(604)1942, Proj. 8641)
(AWS Mannual no. 105-48, vol. 2)
Unclassified report

DESCRIPTORS: *Meteorology, Pacific Ocean, Tropical regions, *Weather forecasting, Meteorological charts, Climate, *Wind.

This supplements other texts on tropical meterology. It makes use of new observational material and accords the synoptic features of the monsoons more attention than they have received in the past. Hints on analysis, and the uses of auxiliary charts and continuity are followed by a chapter on the physical geography of the Pacific and a gazetteer describing the locations and environments of observing stations. Chapter 3 tabulates monthly mean resultant winds, steadiness and other derived data at standard pressure levels for 34 sounding stations. Chapter 4 which broadly considers the climatology of the region, leads to more detailed discussions of the synoptic climatology of the tropospheric field of motion in the central Pacific (Chapter 5) and of the synoptic climatology of the China Seas and southeast Asia (Chapter 6). Appendices amplify the topics covered in this chapter. The final chapters are devoted to tropical cloud physics, local effects and aerial weather reconnaissance. (Author)

AD-255 356 Div. 2, 4
(4 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CONTENT OF RUBIDIUM IN BERYLS FROM PEGMATITE VEINS IN THE KOLA PENINSULA (O Soderzhanii Rubidiya V Berillakh Pegmatitovykh Zhil Kol' Skogo Poluostrova)
by T. F. Borovik-Romanova and A. F. Sosedko. Nov 60, 6p. incl. table. (Trans. no. MCL-48 from Doklady Akademii Nauk SSSR 118:534-536, 1958)
Unclassified report

DESCRIPTORS: Graphite, *Pegmatites, Rock, *Rubidium, Minerals, USSR, Potassium, Alkali metals, *Geochemistry, Geology, *Beryllium, Aluminum compounds, Silicates, Spectrographic analysis, Determination.

Rb was found in all Kola Peninsula beryls investigated. The Rb content has a definite relationship to the paragenetic associations of minerals surrounding it. For the North Kola pegmatite belt the beryls are characterized by very low concentration of Rb less than 0.0033%; in beryls from the contact zone (0.018%) to the center (up to 0.110%). The Rb content runs in the same direction in other minerals. In the microcline boundary zone of the pegmatite vein the Rb content was 0.3%, whereas in microcline from the central part of the same vein it reached 1.20%. Potassium was constantly present in the Rb containing beryls. Both these elements, evidently, are substituting Cs. (Author)

AD-255 357 Div. 2
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PERIODICITY OF THE SOLAR CONSTANT IN CONNECTION WITH WEATHER FORECASTS (O Periodichnosti Solnechnoy v Svyazi S Prognozami Pogody)
by V. G. Fesenkov. Dec 60, 15p. (Trans. no. MCL-70 from Uspekhi Astronomicheskikh Nauk 3:147-154, 1947)
Unclassified report

DESCRIPTORS: *Weather forecasting, *Atmosphere, Solar energy, Solar observatories, Transmission, Solar spectrum.

AD-255 383 Div. 2
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE THEORY OF THE CHROMOSPHERE (Teoriya Khromosphery),
by L. E. Gurevich and A. I. Lebedinskiy. 2 Nov 60, 11p. 10 refs. (Trans. no. MCL-482 from Zhurnal Eksperimental'noy I Teoreticheskoy Fiziki 20: 566-571, 1950)
Unclassified report

DESCRIPTORS: *Solar atmosphere, Theory, Density, Magnetic fields, Turbulence, Turbulent flow, Gas ionization, Solar energy, Heat transfer, Convection, Thermal radiation.

A hypothesis is postulated that the turbulent state of the upper part of the chromosphere is created by rapidly fluctuating magnetic fields emerging with convection of the highly ionized gas of granules. It is shown that these turbulence-forming forces are capable of maintaining a chromosphere of the observed mass, while the forces considered heretofore give a considerably smaller mass. (Author)

AD-255 384 Div. 2, 25
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PROFILES OF HYDROGEN LINES IN A CHROMOSPHERIC SPECTRUM (Profili Vodorodnykh Liniy V Spektre Khromosfery)
by E. V. Kononovich. 2 Nov 60, 15p. incl. illus. table, 28 refs. (Trans. no. MCL-484 from Vestnik Moskovskogo Universiteta; Seriya Matematiki, Mekhaniki, Astronomii, Fiziki, Khimii 4:37-44, 1958)
Unclassified report

DESCRIPTORS: *Hydrogen, *Solar atmosphere, *Solar spectrum, Spectrophotometers, USSR, Spectrographic cameras, Photometers.

Results are presented of processing some of the data on a number of non-eclipse spectra of the chromosphere, obtained on the tower solar telescope at the Crimean Astrophysical Observatory of the Academy of Sciences, USSR. The first 4 lines of the Balmer series of hydrogen, H sub alpha, beta, gamma, and delta are noted. Three types of line profiles are examined: (1) a brightly-expressed double-peaked form; (2) conspicuous self-absorption flattened forms; and (3) Doppler profiles and those similar to them.

AD-255 385 Div. 2, 25, 30
(4 May 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INFLUENCE OF INSTRUMENTAL EFFECTS ON THE MEASUREMENT OF MAGNETIC FIELDS OF THE SUN BY MEANS OF A MODULATION SPECTROPHOTOMETER (Vliyaniye Instrumental'Nykh Effektov na Izmereniya Magnitnykh Poley Na Solntse S Pomoshch'yu Modulyatsionnogo Spektrofotometra)
by A. Ye. Veller. 2 Nov 60, 21p. incl. illus. tables (Trans no. MCL-486 from Trudy Nauchno-Issledovatel'skogo Instituta Zemnogo Magnetizma 11:162-173, 1957)
Unclassified report

DESCRIPTORS: *Sun, Magnetic fields, *Spectrophotometers, Instrumentation, Measurement.

AD-255 445 Div. 2
(8 May 61) OTS price $3.60

Dartmouth Coll., Hanover, N. H.
STRUCTURAL-STRATIGRAPHIC STUDIES ON THE WARD HUNT ICE SHELF,
by John B. Lyons and Frank G. Leavitt. Final rept. 15 Jan 61, 36p. incl. illus. tables, 17 refs.
(Contract AF 19(604)6188)
(AFCRL-442) Unclassified report

DESCRIPTORS: *Ice, Arctic regions, Glaciers, Geological survey, Ice charts.

Reexamination of the stratigraphy of the Ward Hunt Ice Shelf suggests that its uppermost iced-firn and lake ice unit may overlie two different types of basement: (1) an older inner basement, 4 to 5 miles wide consisting partly of iced firn, but with a much larger proportion of sea or fresh-water ice than formerly described, and (2) an outer younger basement, as well as the entire outer portion of the Ward Hunt Shelf, is probably less than 1600 years old; the inner basement is probably 1600 to 3000 years old. (Author)

AD-255 469 Div. 2, 1
(7 May 61) OTS price $5.60

Florida State U., Tallahassee.
A METHOD FOR ESTIMATING VERTICAL PROFILES OF WIND BELOW FLIGHT LEVEL,
by Thomas A. Gleeson. Final rept. 28 Feb 61, 48p. incl. illus. tables, 12 refs.
(Contract AF 19(604)4986)
(AFCRL-297) Unclassified report

DESCRIPTORS: Statistical analysis, *Wind, Mathematical analysis, Northern hemisphere, *Meteorology, Bombing, Atmosphere.

With the aid of numerical examples, a regression method is described by means of which a pilot may use climatological wind data and the observed wind at flight level to estimate the vertical profile of horizontal wind below him. The recent publication of pertinent climatological wind statistics for the Northern Hemisphere makes it possible to extend use of the method to arbitrary locations in that hemisphere. The incorporation of these statistics into the method is discussed. Profile estimates by the method can be improved if further information about their operational purposes is available. It is assumed that the profiles are to be used in bombing operations. Possibilities for further work in profile estimation are discussed. These include the development of wind statistics from synoptic-climatological types, wind classifications, and more detailed use of operational data. Calculated 10- and 90-percentile winds, by seasons, at and below various assumed flight levels at 20 Northern Hemisphere stations are presented. (Author)

AD-255 480 Div. 2
(8 May 61) OTS price $8.10

Hawaii Inst. of Geophysics, Honolulu.
ANALYSES OF MONTHLY MEAN RESULTANT WINDS FOR STANDARD PRESSURE LEVELS OVER THE PACIFIC,
by C. J. Wiederanders. Mar 61, 83p. incl. illus. tables, 35 refs. (Scientific rept. no. 3; Rept. no. 13)
(Contract AF 19(604)7229)
(AFCRL-296) Unclassified report

DESCRIPTORS: *Wind, Pacific islands, Tables, Tropical regions, *Meteorological charts, *Weather forecasting, Meteorology.

A set of sixty analyzed mean monthly resultant wind charts is presented. Analyses, which were made for the standard pressure levels of 850, 700, 500, 300, and 200 mb for each month of the year, encompass the area from 40 degrees N to 25 degrees S, and from 95 degrees E to 140 degrees W. Tabulated, newly available mean resultant wind data for six sounding stations are also listed. (Author)

AD-255 523 Div. 2
(10 May 61) OTS price $0.75.

National Aeronautics and Space Administration, Washington, D. C.
A GEOID AND WORLD GEODETIC SYSTEM BASED ON A COMBINATION OF GRAVIMETRIC, ASTRO-GEODETIC, AND SATELLITE DATA,
by William M. Kaula. May 61, 83p. incl. illus. (Technical note D-702)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-702.

DESCRIPTORS: Gravimetric analysis, Earth, *Gravity, *Geodetic data, Astronomical data, Satellite vehicle research.

A world-wide estimate of the gravity field, based on all available gravimetry and extended by Markov analysis using correlation with elevation, was combined with an estimate of the geoid based

on astro-geodetic data covering 19% of the earth and with secular and long period variations of the 1957 Beta and 1958 Beta satellite orbits, into a generalization of least-squares adjustments taking correlation into account. The value obtained for the quadratic sum indicated that the estimates of variance and covariance should be increased about 44%. The results obtained include: Equatorial radius, 6378163 + or - 21 m; Flattening, 1/298.24 + or - 0.01; Equatorial gravity, 978043.6 + or - 1.2 milligals (Potsdam system); Datum shifts (with three-dimensional standard deviation) for the Americas system, + or - 35 m; Europe-Africa-Siberia-India system, + or - 38 m; Japan-Korea-Manchuria system, + or - 68 m; Coefficients in the spherical harmonic expression of the gravity field up to the 8th degree; and World-wide geoid heights, with standard deviations varying from + or - 10 m to + or - 22 m. (Author)

AD-255 565 Div. 2
(7 May 61) OTS price $6.60

Minnesota U. School of Physics, Minneapolis.
ATMOSPHERIC PHYSICS PROGRAM. Summary rept. 1959-1960.
Mar 61. 58p. incl. illus.
(Contract Nonr-71022)
Unclassified report

DESCRIPTORS: Balloons, *Meteorological balloons, Meteorological instruments, Atmosphere, *Meteorology, High altitude, Sodium, Ozone, Cosmic rays, Solar corona, Solar atmosphere, Temperature, Measurement, Thermometers.

Contents:
Immersion thermometry at high altitude
Sodium flights
Ozone
Bibliography

AD-255 587 Div. 2, 32
(8 May 61) OTS price $10.00

Pacific Science Board, National Research Council, Washington, D. C.
TYPHOON EFFECTS UPON JALUIT ATOLL,
ed. by David I. Blumenstock. 15 Apr 61, 1v. incl. illus. tables (Atoll Research bull. no. 75)
(Contract N7onr-230012)
Unclassified report

DESCRIPTORS: *Tropical cyclones, Economics, Social sciences, Plants, Water waves, *Micronesia, Storms, Pacific islands.

Contents:
Wind, wave, and storm conditions at Jaluit, Jan 7-8, 1958
General description of storm effects
Island structures and their modification
Removal of fine sediments from islets
Ground water
Soils
Flora and vegetation
Typhoon effects on individual species of plants
Terrestrial fauna
Submarine effects of the typhoon
Marine resources
Population and economy of Jaluit
Appendices:
Table of plant species by islets
Gastropod molluscs collected

AD-255 619 Div. 2, 24
(10 May 61) OTS price $5.60

Thompson Ramo Wooldridge, Inc., Canoga Park, Calif.
TYPE II INTERIM TECHNICAL REPORT FOR THE AUTOMATIC MAP COMPILATION SYSTEM,
by S. Bertram and H. M. Beckwith. 7 Mar 61, 43p. incl. illus. (Rept. no. C129-1U9)
(Contract DA 44-009-eng-4596)
Unclassified report

DESCRIPTORS: *Mapping, *Digital computers, Analog systems, Airborne, Automatic, Electronic scanners, Terrain, *Electronic circuits, Correlation techniques, *Aerial photographs, Mathematical analysis, *Optical systems, Cathode ray tubes, Errors, Design, Processing, *Position finding, *Altimeters.

The Automatic Map Compilation System utilizes a small digital computer which directs an analog system to the indicated homologous points on a stereo diapositive pair. An analog scan, with associated correlation equipment, operates to measure the height error, thereby providing a basis for extrapolation to the next point. The detail terrain data is used to produce an orthophoto and the altitude measurement is used to produce a drop-line chart from which the contour lines can be drawn. The system analysis, mechanical design, and computer program have revealed no serious problems. The mechanical system is quite conventional, with carriage supports consisting of ''V'' groove ways using ball bearing blocks and servo motors coupled through precision ball-nut screws and anti-backlash gears. The control system utilizes 400 c components, thereby providing higher speed capabilities and a larger range of design components to select from. The orthophoto and drop-line chart will be produced photographically, the latter by a print-out of three gray tones defining the desired contour intervals. (Author)

AD-255 660 Div. 2
(10 May 61) OTS price $2.60

Air Force Cambridge Research Labs., Bedford, Mass.
WINDS AND CIRCULATIONS IN THE MESOSPHERE,
by Thomas J. Keegan. Feb 61, 19p. incl. illus. (GRD Research notes no. 52; AFCRL-244)
Unclassified report

DESCRIPTORS: Meteorological balloons, *Upper atmosphere, Meteorological data, *Sounding rockets, Diurnal variations, North America, *Wind.

Some preliminary analysis are presented of the winds and circulations in the mesosphere based upon the first year of data collected by the Meteorological Rocket Network. Differences between winds determined from radar targets released by rockets and those from the conventional balloon technique are discussed briefly. The scale of seasonal, daily, and vertical wind variations is illustrated by wind profiles and time cross-sections. They demonstrate clearly the seasonal reversal of mesospheric winds and the existence of large, wind-speed variations over periods of only several days. They also reveal that vertical wind shears of 0.030 per sec, and probably greater, exist at about 180,000 ft. A relationship is indicated between mesospheric circulation changes and subsequent tropospheric circulation changes. Examples are shown of the circulation over North America in spring and summer at heights up to 180,000 ft. Analysis of rocket wind-data indicates that the techniques are sound and that much can be learned by more intensive analysis. (Author)

Division 2 - ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-255 661 Div. 2
(10 May 61) OTS price $1.60

Air Force Cambridge Research Labs., Bedford, Mass.
GRAVITY OBSERVATIONS ALONG THE NORTHERN COAST OF ELLESMERE ISLAND,
by Francis A. Crowley. Feb 61, 7p. incl. illus. tables (GRD Research notes no. 53; AFCRL-251)
Unclassified report

DESCRIPTORS: Arctic regions, Measurement, Gravimetric analysis, *Gravity.

Free air gravity anomalies are tabulated for a remote section of the Northern Ellesmere coast in the vicinity of Ward Hunt Island. A moderately positive reduced free air anomaly is found over a section of known bathymetry. (Author)

AD-255 664 Div. 2, 25
(10 May 61) OTS price $11.50

Air Force Cambridge Research Labs., Bedford, Mass.
AN INVESTIGATION OF A PERENNIALLY FROZEN LAKE,
by David F. Barnes. Dec 60, 134p. incl. illus. tables (Air Force Surveys in Geophysics no. 129; AFCRL TN 60-660)
Unclassified report

DESCRIPTORS: *Lakes, *Ice, Greenland, Surface properties, Trafficability, Biology, Chemical analysis, Thickness, Temperature, Physical properties, Geology, Meteorology, Glaciers, Ablation.

Perennially-frozen Angiussaq Lake, Greenland was examined in 1957 to determine the strength of its midsummer ice cover and the causes of its perennially-frozen conditions. The lake, largest within a 100-mi radius of Thule Air Base, is formed by ice-cap damming of a valley 200 m deep, and has an elevation of 590 m. Water temperatures ranged from 0.1 to 0.7 C and showed that summertime mixing is sufficient to maintain nearly isothermal conditions. Fish, phytoplankton, and chironomid life were found in the lake water. At the end of the 1957 summer, more than 90% of the lake surface was covered by ice averaging 1.5 m in thickness. Variations in melting rate have caused a gently rolling surface that might be smoothed by flooding or scraping. In-place cantilever beam tests showed that the upper half meter of ice had almost no strength but that the lower portion maintained sufficient strength to support heavy loads throughout the summer. A tongue of glacier ice floating in the lake has a thickness of about 100 m and a length of about 3 km. Five smaller ice islands have thicknesses of more than 5 m and are believed to form where snow accumulation exceeds ablation. (Author)

AD-255 671 Div. 2, 25
(10 May 61) OTS price $1.60

Friedman, Morris D., West Newton, Mass.
ON LINEAR THEORIES OF GRAVITATION,
by V. I. Pustovoit. Feb 61, 11p. incl. illus. (Trans. no. P-161 from Izvestiia VUZ, Fizika, 3:63-71, 1960)
(Contract AF 19(604)5969)
(AFCRL-34) Unclassified report

DESCRIPTORS: *Gravity, Experimental data, Theory, Relativity theory, Linear systems.

The Birkhoff and Belinfante linear theories of gravitation are compared with the general theory of relativity. It is shown that such differences between them can be found as can, in principle, be detected by experiments with artificial satellites. (Author)

AD-255 767 Div. 2
(12 May 61) OTS price $6.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
SONIC STRUCTURE OF THE MESOSPHERE,
by Willis L. Webb and Kenneth R. Jenkins. Apr 61, 56p. incl. illus. tables (Special rept. no. 50)
Unclassified report

DESCRIPTORS: *Wind, Temperature, *Sounding rockets, Sound, Propagation, Velocity, *Upper atmosphere, Atmospheric sounding, North America, Atmosphere.

Temperature and wind data up to altitudes of 200,000 ft were obtained with meteorological rockets at various locations over North America during the seasons of 1959 and 1960. Seasonal and geographical variations of the atmosphere's acoustical structure, as derived from these data, are illustrated. The thermal and flow effects on the sonic profiles in the lower mesosphere are pointed out. Data in the form of individual cases of interest and seasonal summaries for several locations are presented. (Author)

AD-255 775 Div. 2
(11 May 61) OTS price $16.50

Army Snow, Ice, and Permafrost Research Establishment, Wilmette, Ill.
BIBLIOGRAPHY ON SNOW, ICE AND PERMAFROST WITH ABSTRACTS,
Jan 60, 249p. (SIPRE Rept. no. 12, vol. 14)
Unclassified report

DESCRIPTORS: *Bibliography, *Snow, *Ice, *Permafrost, Glaciers, Avalanches, Arctic regions, Antarctic regions, Greenland, USSR, Geography, Oceans, Trafficability, Soils, Lakes, Roads, Construction, Foundations (Structures), Buildings, Airplanes, De-icing systems, Transportation, Meteorology, Maps, Geology.

This bibliography is prepared on a continuing basis by the Science and Technology Division of the Library of Congress. The present volume is the fourteenth of a series begun in 1951. The volumes I to V were entitled ANNOTATED BIBLIOGRAPHY ON SNOW ICE AND PERMAFROST. Volumes I to XI were issued semi-annually; thereafter publication has been annual. Each volume is an indexed cumulation of abstracts issued on standard catalog cards during the previous year. Abstracts numbered SIP 17001 through 18000 are included. The primary purpose of the bibliography is to aid the Snow, Ice and Permafrost Research Establishment and other government agencies and contractors concerned with snow, ice and frozen ground conditions.

AD-255 792 Div. 2
(10 May 61) OTS price $2.60

Science and Tech. Section, Air Information Div., Washington, D. C.
PHENOMENA IN THE UPPER ATMOSPHERE. REVIEW OF SOVIET LITERATURE.
Monthly rept. no. 12 for Apr 61, 30 Apr 61, 20p. incl. illus. 10 refs.
(AID rept. 61-50) Unclassified report

DESCRIPTORS: *Scientific research, *Upper atmosphere, *Astrophysics, *Geophysics, *USSR, Literature, Cosmic rays, Solar energy, Ionosphere, Solar atmosphere, Weather forecasting.

Report 12 contains a series of abstracts indicating the extent of Soviet research in the matter of correlating cosmic ray intensity variations with meteorological factors. Materials are concerned with the following topics: (II). Solar radiation and the ionosphere, and (V). Atmospheric electricity. (Author)

AD-255 799 Div. 2
(10 May 61) OTS price $1.10

Science and Tech. Section, Air Information Div. Washington, D. C.
MAGNETISM OF METEORITES.
1 May 61, 1p. (Trans. from Magnetic Properties of the Yardymly Iron Meteorite; Akademiya Nauk SSSR. Doklady 136:568-570, 1961)
(AID rept. 61-57) Unclassified report

DESCRIPTORS: Technological intelligence, USSR, *Meteorites, *Magnetism, Magnetic properties, Physical properties.

Research is reported on the Yardymly meteorite, which fell 24 Feb 1959. Studies show that it is composed of 95% kamacite (Fe, Ni) and 5% schreibersite, rhabdite, and taenite (including plessite). Iron content is 92-93%, and nickel content is 6%. The importance of this study lies in the reliable information gained on the mineral composition and magnetic properties of the meteorites. (Author)

AD-255 859 Div. 2, 30
(12 May 61) OTS price $1.60

Electrical Engineering Research Lab., U. of Texas, Austin.
OBSERVATIONS OF 4.3 mm RADIATION DURING THE SOLAR ECLIPSE OF 15 FEBRUARY 1961,
by L. C. Krause, W. W. Bahn and others. 28 Apr 61, 8p. illus. (Rept. no. 122)
(Contract Nonr-37501, Proj. NR 371 032)
Unclassified report

DESCRIPTORS: *Solar eclipse, *Solar energy, Measurement, Microwaves, Radio equipment, Instrumentation, Solar corona, Brightness, Telescopes.

Techniques used and results obtained in the observation of the solar eclipse of 15 Feb 1961 at a wavelength of 4.3 millimeters are described. Measurements during the period in which the sun was being eclipsed showed a variation in emission as great as two to one between regions that were larger than 0.1 of the solar disc. During the period of solar occultation a mean radiating temperature of 200 K was observed, which was equal to the emission temperature of the moon. Approximately 30 seconds after the second contact, a brightness temperature of approximately 200 K was observed at the western edge of the moon. This was attributed to a solar flare. (Author)

AD-255 868 Div. 2, 19, 24
(12 May 61) OTS price $7.60

Abrams Aerial Survey Corporation, Lansing, Mich.
SANTONI SOLAR METHOD OF AERO-TRIANGULATION.
Final technical rept. June 58-Dec 60. 28 Dec 60, 73p. incl. illus. tables.
(Contract DA 44-009-eng-3639, Proj. 8T35-11-001-04)
Unclassified report

DESCRIPTORS: *Mapping, Geodesics, *Aerial photography, *Aerial cameras, Topographic cameras, Errors, Least squares method.

The final phase in the evaluation of the Santoni Method of Aero-Triangulation is discussed. This method is based on the use of an aerial camera rigidly connected and aligned to a sun camera. These cameras take simultaneous photographs of the ground and sun respectively. Tip and tilt for each photograph can be determined from the resulting solar data. For this test two 100 model strips at 15,000 ft., and two 100 model strips at 25,000 ft., were flown. The triangulation differs from normal methods in that into each model was introduced the predetermined tip and tilt. Two adjustments of the triangulation were carried out; 1, a bridge adjustment with ground control on each end and 2, a cantilever adjustment with only the initial ten models controlled. Final results show the bridge adjusted strips to be within very reasonable limits at both the high and low altitudes, and the cantilever adjusted strips to be somewhat less favorable. However, with certain modifications the cantilever result could be improved. It is concluded that the Santoni Method of Aero-Triangulation affords, within limits, a practical and accurate way of obtaining horizontal and vertical control for topographic mapping over large areas where ground control is sparse or non-existent. (Author)

AD-255 916 Div. 2, 14
(16 May 61) OTS price $2.60

Aeronautical Chart and Information Center, St. Louis, Mo.
SCRIBING ON COATED PLASTICS.
Rev. Feb 61, 15p. (ACIC Technical rept. no. 3, supersedes AD-69 692)
Unclassified report

DESCRIPTORS: *Maps, *Coatings, *Printing, *Plastics, *Lithography, Preparation, Esters, Colors, Vinyl radicals.

Scribing at the Aeronautical Chart and Information Center is concerned primarily with preparing copy for offset printing. Scribing (1) refines linework, (2) separates color categories, and (3) provides copy suitable for lithographic plate-making. Sheet materials may be either vinyl or polyester base, and a transparent orange scribecoating is standard. Two basic procedures are employed: direct-to-plate, in which the negative form is used throughout, and conversion-to-positive, in which an intermediate phase utilizer positive working copy, the choice being dependent on the characteristics of each individual chart assignment. Guide-images and other working copy are prepared accordingly. Methods and equipment are discussed. Instruments and accessories are described and illustrated in considerable detail, and their operation discussed. Several full-page photographs illustrate various scribing techniques. (Author)

AD-255 960 Div. 2, 8
(15 May 61) OTS price $2.60

Norwegian Defence Research Establishment.
SOME RESULTS FROM RIOMETER OBSERVATIONS DURING POLAR RADIO BLACKOUTS,
by O. Holt, B. Landmark, and F. Lied. Sep 60, 23p. incl. illus. table (Technical note no. 1)
(Contract AF 61(052)08)
(AFCRL-96) Unclassified report

DESCRIPTORS: *Ionospheric disturbances, Absorption, *Aurorae, *Radio transmission, Propagation, Probability, Correlation techniques, *Ionospheric propagation, Norway, Analysis, Measurement.

Some results are presented of riometer obser-

vations which were carried out in Norway for about two years. Five riometers were used in the study. The results were analyzed to study the polar radio blackouts. Only the absorption referring to a diurnal curve established from magnetically quiet days was studied. Results are presented concerning (1) the variation of the observed absorption with latitude and time, (2) the relation with geomagnetic auroral activity, and (3) the structure of the disturbances, i.e., the typical size of the absorbing clouds. (Author)

AD-255 961 Div. 2, 8
(15 May 61) OTS price $1.60

Norwegian Defence Research Establishment.
OBSERVATIONS OF ELECTRON DENSITY AND COLLISION FREQUENCY IN THE D REGION DURING POLAR RADIO BLACKOUT CONDITIONS,
by O. Holt, B. Landmark, and F. Lied. Sep 60, 19p. incl. illus. tables (Technical note no. 2)
(Contract AF 61(052)08)
(AFCRL-97) Unclassified report

DESCRIPTORS: *Ionospheric disturbances, Reflection, *Radio transmission, Propagation, Radio waves, *Ionospheric propagation, Absorption, Scattering, Electrons, Density, Norway, *Electromagnetic wave reflections, Measurement, Modulation.

Some results are presented from observations of electron density and collision frequency in the D region during polar radio blackout condition. The observations, which consisted of measurements of ionospheric cross modulation and of partial reflections from the lower ionosphere, were carried out near Tromso, close to the auroral zone. Reliable results could be obtained for both types of observations in a number of cases, when the strength of the echoes observed on 2.7 mc was more than 60 db below the normal signal level, and when no echoes were observed on the recorder. (Author)

3. CHEMICAL WARFARE EQUIPMENT AND MATERIALS

AD-255 010 Div. 3, 14, 26
(1 May 61) OTS price $4.60

Stanford Research Inst., Menlo Park, Calif.
ENCAPSULATED AEROSOLS,
by Robert C. Robbins. Final rept. 1 Apr 60-31 Mar 61. 17 Apr 61, 38p. incl. illus. tables.
(Contract DA 18-108-405-cml-746, Proj. SU-3191)
Unclassified report

DESCRIPTORS: *Aerosols, Condensation, Films, *Coatings, *Encapsulation, Benzoic acids, Vapors, Coagulation, Phthalates, Liquids, Phosphites, Phosphates, Phosphoric acids, Chlorides, Ammonium radicals, Ethylenes, Nitrogen compounds, Dioxides, Polymers, Solids, *Chemical warfare agents, Polymer solutions, Electrostatics, Polymerization.

Various methods of aerosol encapsulation were studied: (1) liquid phase microencapsulation, (2) condensation, and (3) coagulation. Aerosol encapsulation by condensation, using the core particles or droplets as condensation nuclei, proved to be a generally successful technique. Coagulation with inertial forces, using simple low-powered devices, showed little promise as a practical aerosol encapsulation method. Coagulation with electrostatic charging of the particles was only partially successful in solid on liquid and liquid on liquid systems, but worked quite well in encapsulating solid cores with liquid films. Liquid phase microencapsulation was quite successful, where applicable. A number of liquid cores were successfully polymer encapsulated, isolated, dried, and dispersed. (Author)

AD-255 484 Div. 3
(8 May 61) OTS price $5.60.

General Mills, Inc., Minneapolis, Minn.
FUNDAMENTAL STUDIES OF THE DISPERSIBILITY OF POWDERED MATERIALS,
by J. H. Nash, H. W. Zeller and G. G. Leiter. Quarterly progress rept. no. 3, 3 Dec 60-3 Mar 61. 31 Mar 61, 47p. incl. illus. tables.
(Rept. no. 2183)
(Contract DA 18-108-405-cml-824)
Unclassified report

DESCRIPTORS: Powders, Particles, *Aerosols, Organic compounds, Saccharides, Scattering, Tensile properties, Mechanical properties, Electrostatics, Tests, Diffusion, Vapors, Additives, Adsorption, Sulfimides, Glycols, Polymers, Ethylenes, Stearates, Fluid flow.

Factors affecting the flow and dispersibility of organic powders in the 2 - 5 micron size range have been the subject of investigation of this study. The tests reported herein were conducted on samples of finely ground saccharin, Carbowax 6000 and Span 60 or on samples of these powders containing various additives. Several different types of tests were conducted including the following: bulk tensile strength tests, shear strength tests, disc-lifting tests conducted under high vacuum conditions and under laboratory conditions to study effect of removal of adsorbed vapors and gases, tests to determine energy required to disperse an aerosol and electrostatic charge analysis. (Author)

AD-255 589 Div. 3
(12 May 61) OTS price $14.00

Douglas Aircraft Co., Inc., Santa Monica, Calif.
BW/RWS - MODEL DA-88.
Final rept., phase 1. 30 Jan 61, 199p. incl. illus. tables, 14 refs. (Rept. no. SM-38444)
(Contract DA 18-064-cml-2746)
Unclassified report

DESCRIPTORS: *Biological warfare, Biological warfare agents, Detection, Biological environment , Meteorology, Aerosols, *Military communications, Terrain, *Toxic agent alarms, *Data processing systems, Display systems, Biological laboratories, Mobile, Data storage systems, Sensitivity, *Telephone communication systems, Radio communication systems, Atmosphere, Tests.

Investigations are described, relative to the biological warfare/rapid warning system program. Four basic elements are considered: (1) System

Studies, (2) Experimental System Preliminary Design, (3) Instrument Research, and (4) Environmental Studies. System studies include the development of criteria for siting layout, performance and cost-effectiveness of a warning system for a field army. The effects of meteorology, topography and aerosol dynamics in relation to such a system are discussed, along with communication, data processing and display techniques. Part 2 includes the preliminary design of an experimental detection system for full scale field demonstration of the system in the Dallas - Forth Worth area. The design, fabrication and deployment of two Mobile Laboratories used to obtain information on particulate background of the atmosphere in various portions of the United States using prototype detection instruments constitute parts 3 and 4. (Author)

AD-255 726 Div. 3, 4
(10 May 61) OTS price $1.60

Naval Ammunition Depot, Crane, Ind.
CHEMICAL ANALYSIS OF A MAGNESIUM-SODIUM NITRATE COMPOSITION IN A LAMINAC BINDER,
by William Ripley. 5 Apr 61, 15p. incl. tables.
(Rept. no. RDTR no. 21)
Unclassified report

DESCRIPTORS: *Binders, Magnesium, Nitrates, Sodium compounds, Cobalt, *Chemical analysis, Colorimetric analysis, *Pyrotechnics, Powders, Plastics, Propellants, Propellant flashes, Flares, *Illuminating projectiles, Polymers, Esters, Resins, Resin additives, *Titration, *Quantitative analysis, Separation.

A scheme for the chemical analysis of an illuminant composition of Mg, $NaNO_3$, and laminac 4110 binder is described. $NaNO_3$ is removed by water extraction and treated, under an inert atmosphere, with $FeCl_2$ and 12 N HCl. The ferric ion formed in this reaction is then titrated with standard 0.2 N $TiCl_3$ solution. Mg is removed with dilute HCl and determined by titration with 0.1 M EDTA solution. Laminac binder is determined from the sum of the volatiles and the residue remaining after the extraction of $NaNO_3$ and subsequent removal of Mg. The presence of Co due to cobalt naphthanate is detected by the orange color developed in the presence of 1-nitroso-2-naphthol. (Author)

AD-255 998 Div. 3
(17 May 61) OTS price $2.60

Aircraft Armaments, Inc., Cockeysville, Md.
E41R1 POINT SOURCE GAS ALARM,
by E. Tyler. Engineering progress rept. 20 Mar-29 Apr 61, 5 May 61, 1v. incl. illus. tables.
(Rept. no. ER-2369)
(Contract DA 18-108-cml-6553)
Unclassified report

DESCRIPTORS: *Gas detectors, *Toxic agent alarms, Chemical warfare agents, Detection, Photometers, Photoelectric cells, Electronic circuits, Design, Tests, Production.

Further research and development tests and engineering developments have taken place in the following portions of the alarm: (1) experimental and original design air pump tests; (2) several areas of electronics have been modified and tested, including the tape transport drive system, radio interference studies, and engineering studies of the low-voltages cutoff, the regulated voltage, and the alarm light oscillator circuits; (3) new materials and designs of the fluid pump were tested; (4) improvements to the alarm case to enhance water-tightness and ruggedness; (5) investigation into alarm transportability; (6) impact tests and correction of tape drive retraction snubber; (7) development of modified vacuum sensor switch; and (8) analysis of photometer head problems. (Author)

4. CHEMISTRY

AD-254 982 Div. 4
(1 May 61) OTS price $2.60

Purdue Research Foundation, Lafayette, Ind.
PREPARATION AND PROPERTIES OF PHOSPHONITRILE MONOMERS. IV. PREPARATION AND INVESTIGATION OF PARTIALLY SUBSTITUTED PHOSPHONITRILE CHLORIDE AND AMIDE TRIMERS,
by E. T. McBee. Technical rept. no. 4, Jan 59-Dec 60. Dec 60, 18p. incl. table.
(Contract DA 33-008-ORD-1156; Proj. TB2-0001(1395))
(OOR rept. no. 1395:4) Unclassified report

DESCRIPTORS: *Phosphonitrile chlorides, Chlorides, *Amides, Polymers, Alkoxy radicals, Fluorides, Butyl radicals, Ammonia, Chlorine compounds, Phenols, Ethanols, Phenyl radicals, Amines, Esters, Chemical reactions, *Substitution reactions, Condensation reactions, Formaldehyde, Nitriles, Phosphorus compounds, Synthesis.

Partial substitution of chlorine atoms in phosphonitrile chloride trimer by trifluoroethoxy groups yielded trichloride isomers of the formula P3N3(OCH2CF3)3C13, dichloride isomers of the formula P3N3(OCH2CF3)4C12 and the monochloride P3N3(OCH2CF3)5C1. Analogously, tri-, di- and monochlorides, and mixtures thereof, were obtained from phosphonitrile chloride trimer and sodium heptafluorobutoxide. The tristrifluoroethoxytrichlorides and tetrakistrifluoroethoxydichlorides were converted by liquid ammonia to isomeric tri- and diamides of the formulae P3N3(OCH2CF3)3(NH2)3 and P3N3(OCH2CF3)4(NH2)2. Tri(phosphonitrile(trispentachlorophenoxytrichloride was prepared. (Author)

AD-254 983 Div. 4
(1 May 61) OTS price $2.60

Purdue Research Foundation, Lafayette, Ind.
PREPARATION AND PROPERTIES OF PHOSPHONITRILE MONOMERS. V. PREPARATION AND POLYCONDENSATION OF ETHYLENEIMIDO PHOSPHONITRILES,
by E. T. McBee. Technical rept. no. 5, Jan 59-Dec 60. Dec 60, 21p.
(Contract DA 33-008-ORD-1156; Proj. TB2-0001(1395))
(OOR rept. no. 1395:5) Unclassified report

DESCRIPTORS: *Phosphonitrile chlorides, Ethylenes, Imines, Imides, Chlorides, Nitrogen compounds, Polymerization, *Resins, Polymers, Chemical reactions, *Substitution reactions, *Condensation reactions, Amines, Amides, Glycols, Solvent action, Nitriles, Phosphorus compounds, Synthesis.

Trimeric and tetrameric phosphonitrile chloride was reacted with ethyleneimine under various conditions to give ethyleneimido phosphonitrile chlorides of the general formulae, P3N3C1x(NC2H4)6-x and P4N4C1x(NC2H4)8-x. The products underwent polycondensation with certain polyfunctional compounds to give, in some instances, useful resins. (Author)

AD-254 984 Div. 4
(1 May 61) OTS price $1.60

Purdue Research Foundation, Lafayette, Ind.
PREPARATION AND PROPERTIES OF PHOSPHONITRILE MONOMERS. VI. TRIMERIC AND TETRAMERIC PHENYL PHOSPHONITRILIC ESTERS AND THIOESTERS,
by E. T. McBee. Technical rept. no. 6, Jan 59-Dec 60. Dec 60, 14p. incl. tables, 11 refs.
(Contract DA 33-008-ORD-1156 Proj. TB2-0001(1395))
(OOR rept. no. 1395:6) Unclassified report

DESCRIPTORS: *Phosphonitrile chlorides, Chlorides, Nitriles, Phosphorus compounds, Phenols, Thio radicals, Esters, Polymers, Heat, Stability, Infrared spectroscopy, Chemical reactions, Condensation reactions, Substitution reactions, Phenyl radicals, Synthesis.

Reaction of trimeric and tetrameric phosphonitrile chloride with phenol and p-substituted phenols in acetone gave the fully substituted phenyl phosphonitrilic esters of the general formula, (PN(OC6H4-p-X)2) 3 and 4, X equals NO2, Cl, H, CH3, and OCH3. Slight differences in infrared absorption are discussed in terms of substituent influences. Reaction of phosphonitrile chloride trimer and tetramer with thiophenol is believed to have resulted in isomeric mixtures of phenyl phosphonitrilic thioesters. The esters and thioesters are shown to be very stable to high temperatures; polymerization could not be induced. (Author)

AD-254 985 Div. 4
(1 May 61) OTS price $2.60

Purdue Research Foundation, Lafayette, Ind.
PREPARATION AND PROPERTIES OF PHOSPHONITRILE MONOMERS. VII. PREPARATION AND INVESTIGATION OF TRIMERIC AND TETRAMERIC ALKYL PHOSPHONITRILE AMIDES AND THIOESTERS,
by E. T. McBee. Technical rept. no. 7, Jan 59-Dec 60. Dec 60, 19p. incl. tables, 16 refs.
(Contract DA 33-008-ORD-1156; Proj. TB2-0001(1395))
(OOR rept. no. 1395:7) Unclassified report

DESCRIPTORS: *Phosphonitrile chlorides, Chlorides, Phosphorus compounds, Nitriles, Alkyl radicals, Amides, Thio radicals, Esters, Chemical reactions, *Substitution reactions, *Condensation reactions, Synthesis, Fluorides, Amines, Pyrroles, Alkoxy radicals, Polymers, Polymerization, Infrared spectroscopy.

Reaction of phosphonitrile chloride trimer and tetramer, (PNC12)3 and 4, with 2,2,2-trifluoroethylamine gave trifluoroethyl phosphonitrile amide trimer and tetramer. These compounds decomposed on heating without undergoing polymerization. Reaction of (PNC12)3 and 4 with potassium pyrrole gave P3N3(NC4H4)6 and P4N4(NC4H4)8. Reaction of (PNC12)3 with n-butylamine gave the compound P3N3C1(NHC4H9)5 which underwent various subsequent reactions. (PNC12)3 and 4 reacted with ethyl or butyl sodium mercaptide, or with mercaptan and triethylamine, to give partially thioalkoxy substituted phosphonitriles of the average composition PNC1(SR) 3 and 4, and higher polymeric materials. High polymers were obtained on heating the trimers or tetramers. (Author)

AD-254 986 Div. 4
(1 May 61) OTS price $1.10

Tulane U., New Orleans, La.
PREPARATION AND PROPERTIES OF ORGANIC AZIDES, FUROXANES AND psi-OXATRIAZOLES,
by J. H. Boyer. Quarterly status progress rept. no. 8 (Final) 15 June-15 Sep 60. 15 Sep 60, 3p.
(Contract DA 01-009-ORD-699, Proj. TB2-0001)
(OOR rept. no. 2194:9) Unclassified report

DESCRIPTORS: *Azides, Organic compounds, Phenyl radicals, *Phosphines, Oxides, Benzenes, Nitroso radicals, *Organic azides, Pyrroles, Nitro radicals, Synthesis, Preparation, Chemical properties, *Furoxanes.

Triphenylphosphine oxide (I) was obtained in good yield from equimolar quantities of triphenylphosphine (II) and o-dinitrosobenzene in a hydrocarbon solvent. Benzofurazan, was presumably formed simultaneously; although it was not isolated here, it was obtained after steam distillation of a similar reaction mixture in ethanol along with I. Substitution of tri-n-butylphosphine or triethyl phosphite for II afforded benzofurazan in comparable yields. Tri-n-butylphosphine is regarded as a more powerful reagent than II as it converts 1, 2-dinitrosonaphthalene to naphthofurazan and II will not. A good yield of I and a trace of an unidentified solid were isolated in the reaction of o-dinitrobenzene and II.

AD-255 037 Div. 4, 10
(7 May 61) OTS price $2.60.

Air Force Flight Test Center, Edwards Air Force Base, Calif.
RECOMMENDATIONS FOR THE DISTILLATION LIMITS OF SPECIFICATION MIL-P26694 60 PERCENT JP-4/40 PERCENT UNS-DIMETHYLHYDRAZINE.
by H. E. Malone and R. E. Barron. Feb 61, 20p. incl. illus. tables. (Rept. no. AFFTC TR 61-6)
Unclassified report

DESCRIPTORS: *Jet engine fuels, Fuels, *Methyl hydrazines, Specifications, Boiling, *Fractionation, *Purification, Standards, Mixtures, Military requirements, Temperature.

Data is presented which shows that it is possible to procure JP-4 and UDMH, both of which comply with their respective specifications, but when blended fail to comply with the limits of Specification MIL-P-26694. Recommended changes for the 10, 35 and 50% distillation points are 155, 170 and 300 F. respectively. (Author)

AD-255 096 Div. 4
(2 May 61) OTS price $3.60

Leicester U. (Gt. Brit.).
ARYLSILANES AND AROMATIC REACTIVITY,
by J. A. Sperry. Final technical status rept. 1 Jan 58-31 Dec 60. 31 Dec 60, 1v. incl. tables, 45 refs.
(Contract DA 91-591-EUC-1024)
Unclassified report

DESCRIPTORS: *Silanes, *Benzenes, Methyl radicals, Phenyl radicals, Thiophenes, Ethers, *Metalorganic compounds, Carbazoles, Thionaphthenes, Anthracenes, Phenanthrenes, Synthesis, Monocyclic compounds, *Germanium compounds, Fluorenes, Sulfides, Chemical bonds, Benzyl radicals, *Silicon compounds, *Tin compounds, Chemical reactions, Substitution reactions, Polycyclic compounds, Perchloric acid.

This rept. includes:
CHEMISTRY OF ORGANOGERMANIUM COMPOUNDS, by T. W. Swaddle. 31 Dec 60, 8p. incl. tables.
Part I: Aryltrimethylsilanes were prepared, including derivatives of furan, benzothiophene, dibenzofuran, dibenzothiophen, N-ethylcarbazole, diphenyl ether, diphenyl sulphide, fluorene, diphenylmethane, pyrene anthracene, phenanthrene, and dihydrophenanthene. The rates of cleavage of the aryltrimethylsilanes by aqueous methanolic perchloric acid was measured spectrophotometrically. Part II: A preliminary study of the comparative reactivities of some C-Ge, C-Si, and C-Sn bonds is reported. Benzylgermanium bonds are shown to be cleaved much less readily by aqueous ethanolic alkali than are analogous benzyl-silicon bonds, while the latter are less readily cleaved than benzyltin bonds. (Author)

AD-255 155 Div. 4
(2 May 61) OTS price $.50

Princeton U., N. J.
RATES OF EVAPORATION OF LIQUIDS,
by M. Boudart. Mar 61, 12p.
(Contract AF 49(638)32)
(AFOSR-464)
Unclassified report

DESCRIPTORS: *Liquids, *Evaporation, Molecules, Vapors, *Physical chemistry, Measurement, Reaction kinetics, Vaporization, Determination, Theory, Condensation, Heat of reaction, Volume, Entropy.

AD-255 158 Div. 4, 25
(2 May 61) OTS price $1.00

Princeton U., N. J.
INTERFACIAL RESISTANCE TO EVAPORATION,
by W. J. Heideger and M. Boudart. 1 Dec 60. 1v. incl. illus. table, 19 refs.
(Contract AF 49(638)32)
(AFOSR-333)
Unclassified report

DESCRIPTORS: *Liquids, *Evaporation, Vapor pressure, Vapors, Gases, Vaporization, Reaction kinetics, Thermodynamics, Theory, Mathematical analysis, Vacuum apparatus, *Glycerols, Test equipment, Low pressure research, Temperature, Pressure, Surface properties, Adsorption.

A pure liquid evaporates into a vacuum at a rate equal to that predicted by kinetic theory multiplied by a coefficient alpha called the evaporation coefficient. Values of alpha smaller than unity have been reported and they provide a measure of interfacial resistance to evaporation. A new technique has been developed to measure alpha which is free from the usual objections concerning a lowered surface temperature or a contaminated interface. With pure glycerol, alpha equal to 0.05. This result is explained theoretically and provides reliable evidence of true interfacial resistance in the evaporation of a pure liquid. (Author)

AD-255 225 Div. 4, 7
(3 May 61) OTS price $1.60

Naval Ammunition Depot, Crane, Ind.
AN ANALYTICAL METHOD FOR THE DETERMINATION OF ARGENTIC OXIDE (AgO) AND SILVER OXIDE (Ag2O) IN ZINC-SILVER OXIDE BATTERIES,
by R. E. Klausmeier. Mar 61, 14p. incl. illus. tables (Rept. no. QE/C 61-44)
Unclassified report

DESCRIPTORS: *Silver compounds, Oxides, *Chemical analysis, Determination, Gravimetric analysis, *Primary batteries, Temperature, Alkaline cells.

An analytical method has been developed for the determination of argentic oxide (AgO) and silver oxide (Ag2O) in zinc-silver oxide batteries. The developed method requires only a furnace, porcelain crucibles, and an analytical balance.

The method is based on the weight of oxygen liberated during the thermal decomposition of the silver oxides. The experimental work includes thermogravimetric and differential thermal analyses of metallic silver, silver oxide, and argentic oxide. (Author)

AD-255 235 Div. 4
(3 May 61) OTS price $1.10

Pennsylvania State U. Coll. of Chemistry and Physics, University Park.
(No Title)
Technical rept. no. 26. Apr 61, 9p.
(Contract Nonr-65605, Proj. NR 055-328)
Unclassified report

DESCRIPTORS: *Electrons, Exchange reactions, *Organic compounds, *Benzenes, Theory, *Chemical reactions, Nuclear resonance, Electron transitions, *Phenyl radicals, Azo radicals, Ions, Pyrolysis.

REGARDING DIRECT ELECTRONIC EXCHANGE BETWEEN SUBSTITUENTS IN THE META POSITION OF AROMATIC SYSTEMS WITH AN ODD NUMBER OF PI ELECTRONS: Results from reactivity analysis of benzene derivatives appear to confirm the theory that forms involving charge redistribution may be appreciably more important than forms involving long-range charge separation. The results illustrate a new tool for the characterization of the transition state of a radical reaction. In each of the reactivity series noted, the Ar-Y resonance enhanced effects for para substituents are 2 to 3 times greater than for the corresponding meta substituent. EVIDENCE FOR PHENYL CATION WITH AN ODD NUMBER OF PI ELECTRONS FROM THE AQUEOUS THERMAL DECOMPOSITION OF THE DIAZONIUM ION: For the phenyl diazonium ion substituted in the meta-position decreases in free energy of activation imply a high degree of radical-cation character for the transition state of the decomposition reaction. This transition state can be visualized as having a structure with an odd number of pi-electrons. The results appear to indicate rapid rates of spin interconversions in the formation of the phenyl cation and in the reaction of this intermediate with the nucleophile, H20.

AD-255 313 Div. 4, 20, 25
(5 May 61) OTS price $3.60

California U., Berkeley.
MOLECULAR ORBITAL CORRELATIONS IN ORGANIC CHEMISTRY,
by Andrew Streitwieser, Jr. Final rept. 7 Mar 61, 34p. incl. illus. tables, 55 refs.
(Contract AF 49(638)105)
(AFOSR-547) Unclassified report

DESCRIPTORS: *Atomic orbitals, Hydrogen, *Organic compounds, *Ionization potentials, Hydrocarbons, Hydrogen ion concentration, Benzenes, Methyl radicals, Benzyl tosylates, Exchange reactions, Deuterium, Fluoranthenes, Theory.

Experimental work and calculations were conducted to establish the validity of molecular orbital (MO) correlations in the following areas: (1) ionization potentials of organic compounds; (2) acidity of hydrocarbons; (3) acetolysis rates of arylmethyl tosylates; and (4) rates of base-catalyzed hydrogen-deuterium exchange of hydrocarbons. Acetolysis rate studies of compounds of the type, ArCH2OSO2 C6H4CH3 indicated that only fair correlations are obtained between MO predictions and experiment. The products of reduction of aromatic hydrocarbons with alkali metals and liquid ammonia are accounted for with the HMO theory. The deficiencies of the HMO theory arise mainly from its specific neglect of electron-repulsion terms which show up particularly in the treatment of charged species.

AD-255 318 Div. 4, 17, 22
(5 May 61) OTS price $2.60

Frankford Arsenal, Philadelphia, Pa.
COLORIMETRIC DETERMINATION OF METALLIC TIN IN PROPELLANTS BY USE OF HEMATOXYLIN,
by George Norwitz. Mar 61, 21p. incl. illus. tables. (Test rept. no. T61-8-1)
Unclassified report

DESCRIPTORS: *Tin, *Propellants, *Colorimetric analysis, Chemical analysis, Dyes, Organic compounds, Reagents, Metals, Test methods.

A method is proposed for the colorimetric determination of metallic tin in propellants by the use of hematoxylin. A 0.3 gram sample is treated with a mixture of nitric, sulfuric, and perchloric acids, and the solution is evaporated to fumes of sulfuric acid. An aliquot is taken, hematoxylin, gelatin, and sodium acetate are added, and the solution is heated for 15 minutes in boiling water. The factors influencing the color were studied, including the effect of amount of gelatin solution, amount and age of hematoxylin solution, initial acidity, amount of sodium acetate solution (pH), volume at which maximum intensity of the color is developed, order of addition of reagents, time interval between the addition of hematoxylin and sodium acetate, heating time in boiling water, temperature at which the color is read, stability of the color, valence of tin, wave length at which the color is read, and interferences. The method of developing the hematoxylin color is probably applicable to the determination of other metals as well as tin. (Author)

AD-255 360 Div. 4
(4 May 61) OTS price $1.60.

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CHEMICAL ENGINEERING (SELECTED ARTICLES)
Nov 60, 17p. (Trans. no. NCL-99 from Chemische Technik 11:12-15, Jan 59)
Unclassified report

DESCRIPTORS: *Chemical engineering, USSR, Complex compounds, Reactor fuels, Fuel elements, Purification, Polymerization, Polymers, Copolymerization, Plastics, Synthesis, Production, Petroleum industry, Methanols, Petroleum, *Industrial production.

PROGRESS IN THE CHEMISTRY OF COMPLEX COMPOUNDS (USSR): The application of complex compounds in the purification of reactor materials is discussed. Theoretical developments pertaining to the structure compounds are also described. MECHANICAL-CHEMICAL CHANGES AND THE SYNTHESIS OF POLYMERS (USSR): Theories of polymerization and copolymerization are discussed. PROBLEMS RELATIVE TO THE DEVELOPMENT OF THE INDUSTRY OF ORGANIC SYNTHESIS (USSR): The history of the world plastic industry is discussed. AN ATTEMPT TO COUPLE THE SYNTHESIS OF METHANOL WITH DESTRUCTIVE HYDRATION OF PETROLEUM AND TAR FRACTIONS (USSR): Stochiometric aspects of the problem are discussed. The results of a large-scale technical test of the combined reactions are given.

AD-255 366 Div. 4
(4 May 61) OTS price $3.60.

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
BORIDES OF RARE-EARTH METALS (Boridy Redkozemel'nykh Metallov)
by G. V. Samsonov. 11 Oct 60, 31p. incl. tables, 72 refs. (Trans. no. MCL-149 from Uspekhi Khimii 28:189-217, 1959)
Unclassified report

DESCRIPTORS: Rare earth elements, *Borides, *Rare earth compounds, Chemical properties, Synthesis, Crystal structure, Chemical bonds, Electrical properties, Electrical conductance, Thermionic emission, Magnetic properties, Physical properties, Chemical reactions, Electronic equipment, USSR.

A review was made of principal properties and production methods of borides of rare-earth metals and their alloys. It will make possible, in addition to purely practical results, to draw a number of important theoretical conclusions on the nature of bond in this class of compounds of rare-earth metals and on its effect on chemical and physical properties of their borides. (Author)

AD-255 368 Div. 4
(4 May 61) OTS price $4.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THORIUM AND ITS COMPOUNDS (Toriy I Ego Soedineniya)
by D. I. Ryabchikov and Ye. K. Gol'braykh. 18 Oct 60, 43p. incl. tables, 288 refs. (Trans. no. MCL-326 from Uspekhi Khimii (Achievements in Chemistry) 28:408-435, 1959)
Unclassified report

DESCRIPTORS: *Thorium, *Thorium compounds, Heavy elements, Heavy element compounds, Chemical properties, Radioactivity, USSR, *Bibliography, Chemical reactions, Physical properties, Manufacturing methods.

A review is presented of thorium and its compounds, including chemical and physical properties, manufacturing methods, and chemical reactions. The review covers the discovery of the element in 1828 to the developments published in 1958.

AD-255 428 Div. 4, 14
(8 May 61) OTS price $1.60

Applied Science Labs., Inc., State College, Pa.
RESEARCH STUDY OF PHYSICOCHEMICAL TECHNIQUES FOR THE PURIFICATION OF ORGANIC COMPOUNDS,
by Robert F. Sweeny and Arthur Rose. Bimonthly progress rept. no. 15, 1 Jan-1 Mar 61, 18 Apr 61, 3p. illus. table.
(Contract DA 18-108-405-cml-176)
Unclassified report

DESCRIPTORS: Films, Membranes, *Thin films, Polymers, Plastics, Semipermeability, Ethyl radicals, *Organic solvents, Hydrocarbons, Cellulose, Cellulose acetates, Cellulose esters, Ethylenes, Styrenes, Butyrates, *Organic compounds, *Purification, Alcohols, Diffusion, Hexane, Heptanes, Solutions.

Rate determinations have been done using the open permeation cell previously described, and weighing the permeant collected in a cold trap during known periods of time. Total test times ranging from several hours to a week were used. Thirty-six combinations of different films and permeants have been tested. Eleven tests resulted in immediate film failure by dissolving, but the remaining twenty-five combinations gave permeation data. Numerous rate measurements were made during each experiment. These usually showed low initial rates which increased and then leveled off. Some combinations have negligible rates, others gave rates of over 1000 grams per hour meter squared. Duplicate rates on the same film (but different specimen) and test liquid varied by as much as plus or minus 20 per cent. The most important reason for this is believed to be variation in film from one specimen to the next. (Author)

AD-255 479 Div. 4
(9 May 61) OTS price $2.60.

North Carolina U., Chapel Hill.
COPPER AS A PHOTOMETRIC INDICATOR IN THE SELECTIVE CHELOMETRIC TITRATION OF METAL ION MIXTURES,
by David A. Aikens, Gaby Schmuckler and others. 2 Mar 61, 1v. incl. tables, 15 refs. (Rept. no. UNC-Chem. no. 6-CNR)
(Contract AF 49(638)333)
(AFOSR-426)
Unclassified report

DESCRIPTORS: Ions, *Metals, Mixtures, *Chelate compounds, *Copper, Calcium, Magnesium, Cadmium, Complex compounds, Ammonia, Metalorganic compounds, Acetic acid, Ethylenes, *Chemical analysis, *Titration, Chemical equilibrium, Chemical reactions, Photochemistry, Determination, Spectrophotometers, *Chemical indicators, Zinc.

Photometric and point detection permits selective chelometric determination of metal ions in mixtures with much less masking than required for visual or potentiometric techniques. Copper has been found to be a useful photometric indicator for such titrations. Prediction of appropriate titration conditions is readily accomplished with graphical plots of effective chelonate stability. Calcium is determined in the presence of magnesium with ethylene glycol bis(beta-aminoethyl ether)-N,N-tetraacetic acid in 0.5 M ammonium hydroxide at pH 10. Selective determination of cadmium or of zinc in the presence of the other is carried out with diethylenetriaminepentaacetic acid under the same conditions. Attention is directed to the importance of competitive equilibria which affect chelonate stability, and stability constants for ammonia derivatives of some copper chelonates are reported. (Author)

AD-255 511 Div. 4, 25
(11 May 61) OTS price $1.60

Notre Dame U., Ind.
THE KINETICS OF SrO ON Mo BY FIELD ELECTRON MICROSCOPY,
by D. R. Morgan and E. A. Coomes. 22 Feb 61, 15p. illus.
(Contract Nonr-162301, Proj. NR 372-731)
Unclassified report

DESCRIPTORS: Strontium compounds, Oxides, Molybdenum, Chemical reactions, Tungstates, *Electron microscopy, Electron microscopes, *Thin films, *Reaction kinetics, Molybdates, Field emission, Tungsten.

The similarities in the SrO-W and SrO-Mo systems are: (1) The spreading of SrO on Mo is apparently the same type as SrO on W, showing no boundaries; (2) Above 1100 K, a pattern corresponding to the basic molybdate is obtained; (3) Between

1135 and 1400K a stable state forms which may be identified as the normal molybdate; (4) In going from the basic to the normal molybdate, the average work function passes through a minimum and there is an inversion in symmetry of the (111) emission pattern; and (5) Above 1400K, decomposition resulted in a relatively short period of time and patterns identifiable with oxygen on Mo were obtained. Some differences between the two systems are: (1) Spreading of SrO on Mo occurs at temperatures approximately 200K higher than for SrO on W; (2) The basic molybdate shows clusters on the (111) region (These clusters persist until the work function minimum is passed in the basic to normal molybdate sequence); (3) The inversion in symmetry of the (111) emission is not as rapid as in the SrO-W system (A more pronounced symmetry change occurs in the (100) emission; and (4) Apparently the normal molybdate is not stable for long periods of time above 1300K. (Author)

AD-255 547 Div. 4, 25
(8 May 61) OTS price $2.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
THEORY OF DIELECTRIC POLARIZATION IN NON-POLAR FLUIDS,
by A. Isihara. 28 Feb 61, 18p. incl. illus.
(Research rept. no. PIBMRI-897-61)
(Contract AF 30(602)2045)
(RADC TN 61-69) Unclassified report

DESCRIPTORS: *Molecules, *Dielectrics, *Physical chemistry, Mathematical analysis, Polarization, Dipole moments, Fluids.

The dielectric constant of non-polar fluids does not agree with the Clausius-Mossotti formula. The deviation is calculated taking the induced dipole-dipole interactions into consideration. Since the induced dipole moments suggest that the molecules are most likely deformed, the theories developed by Kirkwood, Jvon and others are generalized to treat non-spherical molecules. A new mathematical method is introduced, and the dielectric constant is calculated as a function of the molecular anisotropy. In particular, the so-called rotational fluctuation is found to be composed of two terms, one representing the optical and the other corresponding to the geometrical anisotropy. (Author)

AD-255 655 Div. 4
(9 May 61) OTS price $1.60

Washington U., Seattle.
SOME REACTIONS OF PEROXYDISULFURYL DIFLUORIDE,
by Jean'ne M. Shreeve and George H. Cady. 1961, 21p. incl. tables, 12 refs. (Technical rept. no. 30)
(Contract Nonr-47716)
(ARPA Order no. 26-60, task 2)
Unclassified report

DESCRIPTORS: *Fluorides, *Sulfonyl radicals, Chemical reactions, Peroxides, Sulfonates, Molecular structure, Synthesis.

The reactions of peroxydisulfuryl difluoride with several substances have been examined. Three new fluorosulfonates, octafluorobis(fluorosulfonato) cyclopentane (C5F8(SO3F)2), tetrafluorobis(fluorosulfonato)ethane (C2F4(SO3F)2) and tetrafluorobis(fluorosulfonato)sulfur (VI) (SF4(SO3F)2) were produced by direct combination of peroxydisulfuryl difluoride with perfluorocyclopentene (C5F8) and tetrafluoroethylene(C2F4) at room temperature and with sulfur tetrafluoride (SF4) at 128 degrees respectively. These new compounds have been characterized. Structures have been confirmed by mass, nuclear magnetic resonance and infrared spectra. A white solid, dioxobis(fluorosulfonato)molybdenum (VI) (MoO2(SO3F)2), was obtained with either molybdenum hexacarbonyl or molybdenum metal. (Author)

AD-255 702 Div. 4
(9 May 61) OTS price $1.10

Massachusetts Inst. of Tech., Cambridge.
CHEMISTRY OF BORON,
by F. A. Cotton. Status rept. no. 6, 1 Jan-31 Mar 61. 31 Mar 61, 5p. incl. tables.
(Contract DA 19-020-ORD-4919)
Unclassified report

DESCRIPTORS: *Boron, Chemical reactions, Chemistry, Chemical properties, *Boron compounds, Synthesis, Metalorganic compounds, *Cyanides, Alkyl radicals, Naphthyl radicals, Acids, Transition elements, Chemical bonds, Carbonyl radicals, Butyl radicals, Phenyl radicals Borines.

DERIVATIVES OF DIALKYL AND DIARYLBORON CYANIDES: Di-alpha-naphthylborinic acid was prepared and reacted with hexacyanocobaltic acid. An attempt was made to prepare di-tert-butyl borinic acid by reacting a boron trifluoride-ether complex in anhydrous ether with tert-butylmagnesium chloride. A proton nuclear magnetic resonance spectrum will be used to determine whether one of the fractions obtained is the desired product. PREPARATION AND INVESTIGATION OF COMPOUNDS CONTAINING BORON-TO-TRANSITION-METAL BONDS: Dimesitylborinic acid was prepared by slowly adding boron trifluoride etherate to a tetrahydrofuran solution of mesitylmagnesium bromide at room temperature. Other compounds prepared were butyldiphenylborinate, iso-butyldi-alpha-naphthylborinate, and (pi-C5H5)2Fe2(CO)4. The reaction of diphenylborinic acid with boron trichloride produced an unidentified yellow liquid which solidified upon redistillation.

AD-255 744 Div. 4
(12 May 61) OTS price $1.10

College of Forestry, Syracuse, N. Y.
(No title)
by M. Szwarc. Final rept. 2 Jan 58-31 Jan 61, 17 Apr 61, 4p. incl. table.
(Contract DA 30-115-ORD-902)
(OOR rept. no. 1536.12) Unclassified report

DESCRIPTORS: *Methyl radicals, *Fluorides, *Benzenes, *Ethylenes, Propyl radicals, *Chemical reactions, Heat of formation, Dissociation, Chemical bonds, Hydrogen, Reaction kinetics, Decomposition, Azo radicals, Photolysis, Methanes, Free radicals, Acetyl radicals, Butyrates, Peroxides.

The investigation of the reactions of trifluoromethyl radicals resulted in the following publications: (1) Relative Rates of Addition of CF3 Radicals to Some Olefins and Derivatives; (2) n-Propyl Affinities of Aromatic and Olefinic Compounds; (3) Heats of Combustion of Some Peroxides and the Heats of Formation of Acetate, Propionate, and Butyrate Radicals; (4) Hydrogen Bonding in Radical Reactions - Some Remarks on CF3 Radicals; (5) Kinetics of Decomposition of Isobutyryl Peroxide; (6) Pseudo Energy Transfer in Some Unimolecular Decompositions; (7) Competitive Abstraction of H and D Atoms by Radicals Formed in the Decomposition of Acetyl

Peroxide, tert-Butyl Peroxide, and in the Photolysis of Azomethane; (8) Methyl Affinities Determined by Photolysis of Azomethane (AD-253 445 and included in AD-233 384); and (9) Studies of Cage Reactions.

AD-255 791 Div. 4, 25
(10 May 61) OTS price $1.10.

Science and Tech. Section, Air Information Div., Washington, D. C.
SEMICONDUCTING POLYMERS.
12 Apr 61, 3p. (Trans. from Some Electrophysical Properties of Polymer Complexes Formed by Tetracyanoethylene with Metals; Akademiya Nauk SSSR. Doklady 136:1127-1129, 1961; Letter to the Editor; Akademiya Nauk SSSR. Izvestiya. Otdeleniye Khimicheskikh Nauk 12, pp. 2261, Dec 59; Method of Obtaining Chelate Polymer Compounds (Authors' Certificate no. 126612). Byulleten' Izobreteniy 5, pp. 38, 1960)
(AID rept. 61-49) Unclassified report

DESCRIPTORS: *Semiconductors, *Polymers, *Semiconducting films, *Chelate compounds, Ethylenes, Cyano radicals, Electrical properties, Metals,

This Item is a brief analysis of current Soviet experiments on chelate-type semiconducting polymers. Source (1) describes experiments in which thoroughly cleaned copper, iron, or nickel plates are exposed to vapors of tetracyanoethylene at 150 to 400 C and covered with thin films of a polymer consisting of carbon, nitrogen, and metal bound with ordinary and chelate-type valences into an assumedly azoporphyrin structure. Similar polymers were obtained by A. A. Berlin and associates in 1959 by the condensation of copper-acetonylacetonate with tetracyanoethylene at 160-300 C (2). Source (3) lists an Authors' Certificate (126612) for a method of manufacturing heat-resistant chelate polymers, issued 7 Apr 1959. This method provides both for film production on metal plates and for hot pressing of tetracyanoethylene with finely dispersed metals. (Author)

AD-255 796 Div. 4
(10 May 61) OTS price $1.10

Science and Tech. Section, Air Information Div. Washington, D. C.
PRODUCTION OF CONCENTRATED HYDROGEN PEROXIDE.
21 Apr 61, 2p. (Trans. from Catalytic Synthesis of Hydrogen Peroxide from the Elements Themselves on Palladium. I. Conditions of Obtaining Hydrogen Peroxide; Zhurnal Fizicheskoy Khimii 35:298-305, 1961)
(AID rept. 61-54) Unclassified report

DESCRIPTORS: *Hydrogen compounds, *Peroxides, Synthesis, Production, Hydrocyanic acids, Hydrochloric acid, Oxygen compounds, Gases, Chemical reactions, *Catalysis, Catalysts, Palladium, Decomposition, Temperature, Rocket oxidizers, Liquid rocket propellants.

A systematic verification is reported of the effect of HCN and HCl on the preparation of concentrated H2O2 from oxyhydrogen gas with Pd as the catalyst. Optimum reaction conditions and yields were the objectives. It was established that the formation of H2O2 on the catalyst was the first stage of a reaction involving the oxidation of H; the second stage is the decomposition of H2O2. Certain substances act as specific or selective catalyst poisons for the second stage; HCN of the H ion (in diluted mineral acids) serve in this capacity. HCN (10 to the -4th power normal) and HCl (0.05 normal) effected 75 and 56% yields, respectively. The optimum ratio of the initial substances is the stochiometric ratio for H2O2 or 1:1. A reduction of temperatu: retarded the reaction rate but increased the yield of H2O2. Acidic catalyst carriers accounted for larger yields than amphoteric carriers.

AD-255 804 Div. 4, 10
(10 May 61) OTS price $2.60

Air Force Flight Test Center, Edwards Air Force Base, Calif.
DETERMINATION OF MIXTURES OF DIETHYLENE TRIAMINE WITH HYDRAZINE AND SUBSTITUTED HYDRAZINES, by Hugh E. Malone and Richard E. Barron. Mar 61, 14p. incl. table, 15 refs. (Rept. no. AFFTC TR 61-12)
Unclassified report

DESCRIPTORS: *Hydrazines, *Ethylenes, *Methyl hydrazines, *Amines, Methanols, Hydrochloric acids, Salicyclic acids, Aldehydes, Chemical analysis, Chemical reactions, Colorimetric analysis, Chemical indicators, Titration, Rocket fuels, Rocket propellants, Quality control, Liquid rocket propellants.

A method is presented for determining admixtures of diethylene triamine-hydrazine, diethylene triamine-monomethylhydrazine, and diethylene triamine-1, 1-dimethylhydrazine in a non-aqueous titration system using methanol as a solvent, hydrochloric acid in methanol as the titrant, and bromocresol green as indicator. The method uses the reactions of salicylaldehyde which forms the neutral azine with hydrazine, the neutral hydrazones with monomethylhydrazine and 1, 1-dimethylhydrazine, and a basic Schiff base with diethylene triamine. The total basicity of the admixtures is determined on separate aliquots of the mixtures before and after the addition of salicylaldehyde. This procedure lends itself readily for quality control by untrained personnel with a minimum of equipment. (Author)

AD-255 897 Div. 4
(15 May 61) OTS price $10.00.

Institute of Rubber Research, U. of Akron, Ohio.
DEGRADATION STUDIES ON CONDENSATION POLYMERS, by Maurice Morton and H. J. Harwood. Final rept., 15 Jan 58-14 Jan 61, 14 Jan 61, 122p. incl. illus. tables, 11 refs.
(Contract DA 36-039-sc-74932, Proj. 3-99-15-108)
Unclassified report

DESCRIPTORS: *Condensation reactions, *Polymers, *Chemical bonds, Stability, Reaction kinetics, Chemical reactions, Hydrolysis, Molecular weight, *Urethanes, Decomposition, Esters, Deterioration, Ethers, Pyridines, *Polycyclic compounds, *Metalorganic compounds, *Titanium compounds, Dienes, *Silicon compounds, Acrylic resins, Synthesis, Resistance, Polymerization, *Styrenes,

CONTENTS: MOLECULAR WEIGHT DISTRIBUTIONS OF POLYURETHANES - Poly(ester-urethanes) ESTD-IK, ESTD-L, and ESTD-M, and Poly(ether-urethane) EHTD-K; HYDROLYTIC DEGRADATION OF URETHANE POLYMERS; BULK DEGRADATION OF POLY(ETHER-URETHANE) - Theoretical treatment of the recombination of networks during degradation, and Degradation kinetics of biuret-crosslinked poly(ether-urethane); NETWORK DEGRADATION STUDIES BY ELEC-

TRICAL MEASUREMENTS - Kinetics of polymerization from electrical resistivity, Molecular weight dependence of electrical resistivity, and Theoretical characteristics of resistance changes; and NEW POLYMERS - Si-Ti copolymers, and Polymers containing bicyclic rings.

AD-255 952 Div. 4, 25
(15 May 61) OTS price $1.10

Illinois U., Urbana.
REACTIONS OF NITROGEN (II) OXIDE. A SPIN-FORBIDDEN TRANSITION OF NO OBSERVED IN SOLUTION SPECTRA,
by T. S. Piper and Russell S. Drago. 1960, 6p. incl. illus. tables (Technical rept. no. 5)
(Contract DA 11-022-ORD-2772, Proj. 2069)
(OOR Rept. no. 2069:4) Unclassified report

DESCRIPTORS: *Nitrogen compounds, Dioxides, Organic solvents, Solvent action, Atomic energy levels, Atomic orbitals, *Molecular spectroscopy, Electrons, Excitation, Ultraviolet spectroscopy, *Forbidden transitions.

The transition occurs at 3.5 ev in the UV spectra of NO dissolved in organic solvents. The observed vibrational frequencies range from 1/1100 cm in CCl4 to 1/1600 cm in CH3OH. These trends are correlated to the shift of electron density out of the Pi antibonding level upon formation of hydrogen bonds with the solvent. Investigations of the absorption spectrum of nitric oxide in polar solvents led to the discovery of a band with well resolved vibrational fine structure commencing at 3850A and extending to shorter wavelengths. This band is not observed in the gaseous spectra. The band was analyzed by assuming that it is due to a spin-forbidden transition at about 4.5 ev above the ground state. (Author)

AD-255 972 Div. 4, 9, 25
(15 May 61) OTS price $7.60

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
TRANSPORT PROPERTIES OF POLAR GASES,
by L. Monchick and E. A Mason. Feb 61, 70p. incl. illus. tables, 44 refs. (Rept. no. CM-993)
(Contract NOrd-7386; In cooperation with Institute of Molecular Physics, U. of Maryland, College Park)
Unclassified report

DESCRIPTORS: *Gases, Integral equations, Diffusion, Viscosity, Molecules, Tables, Thermal diffusion, Heat transfer, Dipole moments, Physical chemistry, *Transport properties.

A model is proposed for the calculation of viscosity, diffusion, thermal diffusion, and the translational part of the heat conductivity of dilute polar gases. It is assumed that the molecular collision trajectories are negibly distorted by transfer of internal rotational energy, and that the relative orientation of two colliding dipoles remains fixed throughout the significant portion of the collision trajectory around the distance of closest approach. (Author)

5. COMMUNICATIONS

AD-255 154 Div. 5, 8
(2 May 61) OTS price $6.60

PRD Electronics, Inc., Brooklyn, N. Y.
SPEECH BANDWIDTH COMPRESSION SYSTEM (SCANNING FILTER),
by A. P. Albanese. Quarterly project rept. no. 2, 1 Nov 60-31 Jan 61. 31 Jan 61, 63p. incl. illus. table.
(Contract DA 36-039-sc-85140, Proj. NR. 3B-31-01-001)
Unclassified report

DESCRIPTORS: *Speech transmission, Feedback, *Band-pass filters, Speech representation, Speech, Time, Frequency, Effectiveness, Oscillators, Delay lines, Distribution, Magnetic recording systems, Measurement, Amplifiers, Intelligibility.

Progress is described in the analysis, experimentation, and fabricational activity directed toward realizing a time-frequency scanning speech compression system. In order to predict the expected degree of bandwidth compression for the scanning filter system, the analysis was directed toward experimental measurements of interrupted speech. The results are shown in a twofold manner, e.g. sound spectrograms and articulation scores. The delay in receiving a successful reverberator has limited the experimentation somewhat, but a sufficient amount of data is included which contains pertinent information. (Author)

AD-255 184 Div. 5, 1, 8
(3 May 61) OTS price $9.10

Bendix Radio Div., Bendix Aviation Corp., Baltimore, Md.
AUTOMATIC REMOTE TUNING SYSTEM FOR GROUND-AIR UHF COMMUNICATIONS.
Apr 61, 95p. incl. illus. table (Rept. no. 471-938-412)
(Contract AF 33(616)7311, Proj. 4335)
(WADD TN 61-40) Unclassified report

DESCRIPTORS: Automatic, *Tuning devices, *Radio communication systems, Radio equipment, Airborne, Ultra high frequency, Surface to air, Remote control systems, Electronic circuits, *Tuning circuits, Aircraft, Air control centers, Radio jamming, Radio receivers, Radio transmitters.

The research objective was to provide a feasible system for automatically tuning a selected airborne communication set from a remote ground installation without the aid of an airborne operator. The system was to be compatible with selective calling equipment, be capable of remotely tuning the AN/ARC-34 Radio Set, and be adaptable for use with several different airborne radio sets. To develop such a system, a study program was conducted to clearly define the problems and to develop the necessary solutions in terms of circuitry and techniques. Susceptibility of the system to enemy jamming was also studied. A breadboard model capable of remotely tuning the ARC-34 was constructed. The model of the remote tuner needs only minor modifications to integrate it with selective calling equipment. A modular packaging technique is used to package both the ground and airborne equipment of the tuning system. (Author)

AD-255 267 Div. 5
(5 May 61) OTS price $3.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
PRESENT ADDRESS SELECTION FOR DIGICOM, A DIGITAL COMMUNICATION SYSTEM,
by R. Frank. Nov 60, 35p. incl. illus. (ASRDL technical rept. no. 2170)
Unclassified report

DESCRIPTORS: *Telephone communication systems, *Pulse communication systems, Digital systems, *Multichannel telephone systems, Design, *Voice communication systems, Effectiveness, Electronic circuits, *Trigger circuits, Switching circuits, Multiplex transmission.

A method for decreasing the amount of time a caller may have to wait for service is discussed. The design of the necessary circuitry to adapt DIGICOM for operation with preset address selection is described. It is concluded that the advantages of preset address selection are many and that a completely new DIGICOM should be built to show the full capabilities of this method. (Author)

AD-255 413 Div. 5, 8
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
COMPOSITE CERTIFICATES FOR RADIO STATIONS.
Nov 60, 14p. (Trans. no. F-TS-9714/III from Pasport Svodnyy na Radiostantsiyu, pp.1-15, 1956)
Unclassified report

DESCRIPTORS: *Radio stations, *Radio equipment, Quality control, USSR.

AD-255 746 Div. 5, 30
(12 May 61) OTS price $1.60

Stromberg-Carlson Div., General Dynamics Corp., Rochester, N. Y.
SPEECH-TO-CODE CONVERTER STUDY,
by R. A. Houde. Quarterly rept. no. 5, 1 Aug-31 Oct 60. 15 Nov 60, 15p.
(Contract DA 36-039-sc-78908)
Unclassified report

DESCRIPTORS: *Speech representation, Tests, *Coding, Speech, Acoustic filters, Language, *Data processing systems, Computers, Synthesis.

The relationships between the formant frequencies of the nonsteady-state vowels and their steady-state vowel equivalents have been investigated. The acoustic elements necessary for the recognition of synthesized consonants have been studied. This was done to gain knowledge of the consistency of their appearance in syllables spoken in isolation. The study of the relationship between the steady-state and nonsteady-state vowels revealed that the principal values of the formant signals are at the maximum, minimum, and steady-state points. Where the steady-state portion does not exist, the situation becomes more complex and vowels must be evaluated in terms of their contextual end points. The study of the initial consonant transitions of the first four formants has shown a means to separate the bilabial from the dental stops, nasals and fricatives. The method of normalizing the energy maximums of the fricatives and affricates with respect to the purely voiced portion of the contextual vowel appears promising. (Author)

AD-255 754 Div. 5
(11 May 61) OTS price $1.10

Communications Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
AIR-GROUND METEORIC SCATTER COMMUNICATIONS,
by James I. Barker. Rept. on Meteoric Scatter Air/Ground Radio Communication System. Feb 61, 5p.
(Proj. 4335)
(WADD TR 61-111) Unclassified report

DESCRIPTORS: Communication systems, Tests, *Radio communication systems, Meteors, Ionization, Reflection, Radio signals, Modulation, Frequency shift keyers, Airborne, Very high frequency, Data transmission systems, Design, *Military communications, Phase shifters.

Results are presented of a study and program to develop air-ground long-distance communications by reflecting radio-frequency signals from the ionized trails generated by meteors entering the earth's atmosphere. In point-to-point tests, the breadboard model transmitted messages over a distance of about 1460 km. Test results obtained during the most unfavorable part of the day indicated half-hourly data rates of eight words per minute. Waiting times of less than four minutes were observed for 95 percent of the time. The modulation technique employed was frequency shift keying. The capability to utilize frequency shift keying or phase shift keying was planned for the air-ground test. The meteoric scatter system developed may be useful as a back-up for present primary communications in transferring high- priority information at a low rate. (Author)

AD-255 768 Div. 5, 12, 2
(9 May 61) OTS price $10.10

Bendix Systems Div., Bendix Aviation Corp., Ann Arbor, Mich.
MAGNETOHYDRODYNAMIC MODE COUPLING INVESTIGATION
by Lindsay Waldorf. Final rept. 17 Feb 61, 1v. incl. illus. 114 refs. (Rept. no. BSR-455)
(Contract AF 30(602)2089)
(RADC TR 61-69) Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, Plasma physics, Extraterrestrial radio waves, *Communication systems, Propagation, *Radio communication systems, Electromagnetic waves, Mathematical analysis, Numerical analysis, Reflection, Refraction.

Wave phenomena was studied in a magnetoplasma to ascertain which of these phenomena might be used in the design of future space communication systems. Major emphasis was placed on several broad aspects of plasmaelectrodynamics: investigation of the characteristic modes, coupling of modes by plasma unhomogeneities, propagation of non-planar electromagnetic waves in a magnetoplasma, focusing caused by the anisotropy of the medium, and propagation of electromagnetic waves in an unhomogeneous plasma. A rather striking demonstration of the effects of a magnetoplasma on wave propagation was provided by a numerical study in which constant plane surfaces of a non-plane monochromatic wave in an infinite homogeneous magnetoplasma act to strongly focus electromagnetic energy into directions normal to the stationary impressed magnetic field. (Author)

AD-255 816 Div. 5, 11
(12 May 61) OTS price $1.60

Aberdeen Proving Ground, Md.
ROAD TESTS AND RAILROAD HUMPING TESTS OF 60-CHANNEL TACTICAL RADIO SYSTEM, AN/FCC-17 (XW-1) AS TRANSPORTED ON A FOUR-WHEELED MOBILIZER,
by Y. Kamita. May 61, 20p. incl. illus. (Rept. no. DPS-223)
Unclassified report

DESCRIPTORS: *Vibration, Shock resistance, *Radio communication systems, Torsion bars, Tests, Cargo vehicles, Failure (Mechanics), Multiplex transmission, *Radio equipment, Mobile, *Transportation, Railroad cars, Vibration isolators, Trailers.

The 60-channel tactical radio system, AN/FCC-17 (XW-1) on a four-wheeled mobilizer was subjected to limited durability tests over various courses and to a rail impact (humping) test. Testing disclosed that the mobilizer failed to properly track the towing vehicle and could not be towed safely above 30-mph road speed, the shock absorbers on the front wheels of the mobilizer lost fluid after five laps over the Munson vibration course, and the 7.9- and 8.5-mph rail impact did not damage the shelter or the mobilizer. Structurally, the AN/FCC-17 is capable of withstanding the shock and vibration environment to which it was subjected. The steering (tracking) characteristics of the mobilizer are unsatisfactory for high-speed operation. Durability characteristics of shock absorbers on the front mobilizer unit are inadequate for extended operation on rough terrain. (Author)

6. DETECTION

AD-255 238 Div. 6, 22
(3 May 61) OTS price $5.60

RCA Defense Electronic Products, Burlington, Mass.
RESEARCH ON A PASSIVE RANGING METHOD.
Final rept. 9 May-9 Nov 60. 15 Nov 60, 49p. incl. illus. tables, 12 refs. (Rept. no. CR-588-49)
(Contract DA 44-009-eng-4474)
Unclassified report

DESCRIPTORS: *Stereoscopic range finding, Range finding, Thermal targets, Photographs, *Photographic equipment, Television equipment, Image intensifiers (Electronics), *Fire control systems, *Optical equipment, *Optical images, Stereoscopic vision, Design.

An experimental investigation was made of a passive ranging method. The research evaluates human operator performance on a stereoscopic ranging task as a function of image quality and characteristics. Visual photographs, photographs degraded by scan lines, thermal photographs, and video photographs were presented in a stereoscopic trainer, and operators' performance assessed. The results indicate that accuracy decreases with increasing image degradation. The results suggest that image enhancement techniques may increase ranging accuracy with very poor quality images. (Author)

AD-255 510 Div. 6, 30
(11 May 61) OTS price $10.10

Space Technology Labs., Los Angeles, Calif.
ADVANCED TELEMETRY SYSTEM STUDIES,
by A. Egger. Final rept. 31 Jan 61, 1v. incl. illus. (Rept. no. STL/TR-60-0000-19430)
(Contract AF 04(647)619)
(AFBMD TR 61-14) Unclassified report

DESCRIPTORS: *Telemeter systems, *Data processing systems, *Electronic circuits, Communication systems, *Data transmission systems, *Satellite vehicles, *Spaceships, Programming, Mathematical logic, Automatic, *Telemetering data, Analog to digital converters, Airborne, Instrumentation, Data storage systems, Switching circuits, Transistors, Diodes, Trigger circuits, *Guided missiles, Pulse modulation, Coding.

Results of studies carried out on advanced telemetry systems are presented. Included is a brief discussion of the applications of conformal (adaptive) telemetry systems and a description of a prototype conformal unit designed and constructed to demonstrate feasibility of the concept, together with a complete PCM telemetry system designed to operate with the conformal unit. Other studies which are described include the design and fabrication of a small computational data processor for linearization of ground checkout data, and investigations of special circuits, including magnetic core information storage, low-level switching transistors, and a tunnel-diode shift register. (Author)

AD-255 514 Div. 6, 8
(11 May 61) OTS price $2.60

Sylvania Electric Products, Inc., Waltham, Mass.
MICROWAVE BEAM-STEERING TECHNIQUES.
20 Feb 61. 1v. incl. illus. (Technical note TN480-3)
(Contract AF 30(604)2280, Proj. 4506)
(RADC TN 61-53) Unclassified report

DESCRIPTORS: *Microwave equipment, *Delay lines, *Radar antennas, Radiofrequency oscillators, Phase measurement, Test equipment, Design, Radar equipment, S band, L band, C band, Oscillators, Radiofrequency filters, Tests, *Microwave oscillators, Phase shifters.

Efforts were made to develop a delay line technique capable of electronically phasing elements of steerable radar antenna arrays. The system consists of a double-fed delay line having thirty phase-controllable outputs. The phase relationship of these output signals is controlled by a variable frequency oscillator. The electrical designs of all components required for the breadboard system were successfully completed. Fabrication of all the required items is near completion. Assembly and tests of breadboard components were begun. The beam-steering oscillator and the phase measurement system were tested with satisfactory results. (Author)

AD-255 820 Div. 6, 8, 19
(9 May 61) OTS price $13.50

Convair-Astronautics, San Diego, Calif.
PRECISE LONG RANGE RADAR DISTANCE MEASURING TECHNIQUES,
by C. K. Rutledge, R. A. Bowers and others. 13 Feb 61, 1v. incl. illus. tables. (Rept. no. AE61-0061)
(Contract AF 30(602)2196)
(RADC TR 61-70) Unclassified report

DESCRIPTORS: *Radar tracking, *Guidance, *Radar navigation, *Radio navigation, Errors, *Radar equipment, *Satellite vehicles, *Space navigation, *Lunar probes, *Spaceships, *Range finding, *Radio transmission, *Position finding, *Orbital flight paths, *Satellite vehicle trajectories, Tracking, *Wave transmission, Radio equipment, Manned, Atmospheric refraction, Propagation, Electromagnetic waves, Simulation, Determination, Mathematical analysis, Atmosphere.

An analytical investigation of 200- to 3,000-naut-mil baseline radio tracking systems was conducted. The evaluation considered the use of the systems in tracking and guiding earth satellites and lunar spacecraft. Representative error models for several tracking systems were formulated and compared. The comparison showed that systems which measure slant range only, contain fewer sources of error. A tracking system simulation employing computer programs and a high-speed digital computer is described. Use of the tracker simulation to depict the error model of a range-only tracking system, together with representative spacecraft trajectories is discussed. The results of the tracker simulation are presented for a system including survey (tracker location) errors and a system without survey errors. An analysis of a geodetic satellite method of survey in the tracking system is presented. An evaluation of tropospheric propagation effects on the radio measurement of slant range is presented. (Author)

AD-255 933 Div. 6, 12
(17 May 61) OTS price $5.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
DORSETT TM-4-31 TELEMETRY TRANSMITTER SPECTRUM UTILIZATION,
by William E. Castilo. 10 Apr 61, 56p. incl. illus. tables (AFC rept. no. TM 10-4-61-T)
Unclassified report

DESCRIPTORS: *Telemetering transmitters, Radiofrequency spectrum analyzers, Low frequency, Tests, Radio interference, Radio equipment, Radiofrequency, Guided missiles, Radio interference, Standing wave ratios, Frequency stabilizers, Telemeter systems.

Results of a laboratory investigation to determine the spectrum utilization of the Dorsett, model TM-4-31 telemetry transmitting package are given. These results were necessary to allocate frequencies on an interference free basis. Operational characteristics, such as frequency stability, power output, deviation and residual FM were empirically examined against the parameters of supply voltage variation and operating time. VSWR, spectrum analysis and interference characteristics (antenna conducted, case radiated and power line conducted) were also examined. (Author)

AD-255 950 Div. 6, 12
(15 May 61) OTS price $4.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
RADAR AND OPTICAL OBSERVATIONS ON REENTRY OF THE TRAILBLAZER I (D-58) TEST VEHICLE OF MARCH 29, 1960,
by Harold L. Kasnitz. June 60, 1v. incl. illus. tables (Rept. no. 312G-0001-1)
(Contract AF 19(604)4559)
Unclassified report

DESCRIPTORS: *Re-entry vehicles, Flight paths, Guided missiles, Guided missile trajectories, Guided missile tracking systems, *Radar tracking, Optical tracking, Data, Experimental data, Test vehicles, *Research test vehicles, Rocket trajectories, *Doppler tracking, Experimental data, S band.

The Trailblazer I-a vehicle was observed by the Wallops Island S-band tracker and the UHF Millstone Hill radar. The vehicle malfunctioned during or after the firing of the 4th stage (T-40) motor. The Wallops Island S-band radar tracked the T-40 and observed the reentry into the atmosphere at a velocity of 8,500 fps. This reentry was simultaneously observed by Millstone over the altitude region of 328,000 ft to 179,000 ft. Subsequent to T-40 firing and prior to the event above, the Millstone radar obtained a short track on a target different from the T-40. Definitive identification of this target is not possible. The most probable identification is the T-55 fifth stage rocket motor. No visual or photographic observations of a luminous reentry were obtained. A series of short duration quasi-periodic spikes observed during the deceleration of the (probable) T-40 is described. (Author)

AD-255 966 Div. 6
(16 May 61) OTS price $9.60

Servo Corp. of America, Long Island, N. Y.
INVESTIGATION INTO SELECTIVITY AND CO-CHANNEL OPERATION OF A DOPPLER TYPE DIRECTION FINDER AN/TRD-15,
by John Beukers. Final rept 1 Mar 61, 112p.
incl. illus. tables, 20 refs. (Rept. no. SCA-18700-R7)
(Contract DA 36-039-sc-84941)
Unclassified report

DESCRIPTORS: *Direction finding, Detection, *Radio equipment, *Doppler systems, Phase modulation, Spectrographic analysis, *Radio signals, Phase detectors, *Bearing finding, High frequency, *Radio interception, Design, Electronic circuits, Antennas, Impedance, Measurement, Signal-to-noise ratio, Sidebands, Circuits, *Discriminators, Countermeasures, Radio receivers.

Investigation and study was made on the possibility of achieving a greater degree of selectivity and of being able to obtain bearing information from the weaker of 2 co-channel signals in the HF Doppler Direction Finder, AN/TRD-15. A brief description of the fundamental principles of the equipment is given. A theoretical and experimental analysis of the spectra containing the wanted bearing information, and produced by the commutating process, is made. The coherent detector and feed-forward techniques for obtaining greater selectivity and co-channel operation respectively are described, and the experimental findings reported. Various methods of phase compression are considered. A panoramic type of display and IF display and tuning indicator are described. Some of the circuitry used in the investigation is described including the coherent detector, amplifiers and limiters used in the feed-forward technique. Schematics of the breadboard monitor and detector are presented. (Author)

AD-255 991 Div. 6
(17 May 61) OTS price $2.60

Air Force Proving Ground Command, Eglin Air Force Base, Fla.
EVALUATION OF A TRACKING ERROR MEASUREMENT DEVICE,
by David J. Edwards and James F. Long. Apr 61, 18p. incl. illus. tables (APGC TR 61-21)
(Proj. no. APGC 8780V3)
Unclassified report

DESCRIPTORS: *Television tracking systems, Errors, Measurement, *Television equipment, Detection, Phototheodolites, Tracking, Tests, *Radar tracking, *Digital recording systems, Data processing systems, *Optical tracking, Test methods, Aerial targets, Sensitivity, Test equipment, Monitors.

Evaluation tests were conducted on a breadboard TEMD (tracking error measuring device) developed to investigate and study the feasibility of using television techniques to measure tracking error of optical and electronic tracking instrumentation. In spite of shorter focal length optics, the TEMD detection, discrimination, and maximum range performance compared favorably to that of a Contraves cinetheodolite. It was observed that TEMD manual tracking extended the present range of the Contraves cinetheodolite by approximately 25%. Feasibility of the TEMD was not completely evaluated because the dynamic tracking accuracy could not be measured. Static tracking accuracy was measured in the laboratory. (Author)

7. ELECTRICAL EQUIPMENT

AD-255 094 Div. 7, 4
(2 May 61) OTS price $7.60

Polytechnic Inst. of Brooklyn, N. Y.
FUEL CELL MATERIALS,
by H. P. Gregor and A. Tejeda. Quarterly progress rept. no. 1, 1 Sep-30 Nov 60. 30 Nov 60, 1v. incl. tables.
(Contract DA 36-039-sc-85384)
Unclassified report

DESCRIPTORS: *Fuel cells, *Electrolytes, Materials, *Membranes, Stability, Pressure, Temperature, Organic solvents, Moisture, Ion exchange, Physical chemistry, Physical properties, Specifications, Conductivity, Electrochemistry, *Power supplies.

This report includes:
MEMBRANE EVALUATION PROGRAM,
by H. P. Gregor, R. Kramer and others. 1 Jan 61, 38p. incl. tables.

The physical chemistry of the function of membrane electrolytes is reviewed, with a discussion of the apparent problems attendant with their use. The requirements for membrane electrolytes as set forth by the Signal Research and Development Laboratory are discussed, and a series of characterization procedures is proposed. The results of a previous, extensive study on the properties and long-term stability of commercial membranes is appended to the report, and estimates are made as to which membranes might be considered for fuel cell applications. Plans for the preparation of new membrane electrolytes are described. At this time it appears that few, if any, of the commercially available membranes satisfy the stated requirements of this project, but some of these appear to be able to be modified so as to be satisfactory. One difficulty envisioned is how to establish truly definitive specifications and evaluation procedures. (Author)

AD-255 251 Div. 7, 26
(3 May 61) OTS Price $1.60

Sprague Electric Co., North Adams, Mass.
INDUSTRIAL PREPAREDNESS MEASURES ON SOLID ELECTROLYTE BATTERIES,
by S. B. Williams and A. G. Ceely. Quarterly rept. no. 8, 1 Oct-31 Dec 60. 31 Dec 60, 16p. incl. illus. tables.
(Contract DA 36-039-sc-81251)
Unclassified report

DESCRIPTORS: *Electrolytic cells, *Storage batteries, Manufacturing methods, Production, Tests, Electrical equipment, Electrical properties, *Cathodes (Electrolytic cells), Design, Materials, Quality control, Aging, Temperature, *Dry cells, Industrial production.

The problem of low open circuit voltage on the individual cell manufacture was investigated. This led to the discovery that humidification of the cathode constituents led to an immediate improvement in cell yields. Five per cent by weight of water was therefore added to the dry cathode mix prior to mixing with the grease binder which gives a total cathode, added water content, of about 3%. This water content was not present as such in the cathode, but was strongly absorbed by the dry cathode constituents and the cathode powder remained dry in appearance. The result of this additional moisture content increased the cell yields, stabilizing the open circuit voltage at a satisfactory level. In addition, the low temperature properties improved. There were also some problems with the battery assembly which were solved. Each cell layer is separately interleaved with .001 in. Teflon foil and the layers are then combined into a complete battery. The final assembly is wrapped with .001 in. Teflon foil which is secured with pressure-sensitive Mylar tape. Using this technique, the rows of cells are kept straight and parallel which allows easier insertion into the battery container. (Author)

AD-255 294 Div. 7, 25
(5 May 61) OTS price $9.60

Naval Research Lab., Washington, D. C.
DIRECT ENERGY CONVERSION LITERATURE ABSTRACTS.
Mar 61, 111p.
Unclassified report

DESCRIPTORS: *Power supplies, *Energy, *Bibliography, *Thermoelectricity, *Fuel cells, *Thermionic emissions, *Photoelectric cells, Electrochemistry, Primary batteries, Storage batteries, Solar energy, Nuclear energy, Magnetohydrodynamics, *Solar cells, Materials, Alloys, Design, Generators, Indexes, Semiconductors, Silicon.

This bibliography contains 547 annotated references on direct energy conversion covering the

following topics: (1) energy conversion (general, bibliographies, and patents); (2) thermoelectricity; (3) thermionic emission; (4) photoelectric processes; (5) magnetohydrodynamics; (6) electrochemical processes; and (7) energy sources. Entries are grouped into these sections alphabetically by author or by title if the author is lacking; for research reports the listing is alphabetical by issuing agency. The number of items pertaining to each topic and subtopics is indicated. Of the 547 references, 387 are entered under thermoelectricity. An alphabetical author index is also included.

AD-255 310 Div. 7, 25
(4 May 61) OTS price $5.10

Curtiss-Wright Corp., Princeton, N. J.
SOLAR THERMOELECTRIC GENERATORS FOR APPLICATION OUTSIDE THE EARTH'S ATMOSPHERE,
Rept. on Phase 1, Nov 59-Feb 60. Feb 60,. 81p. incl. illus. tables, 86 refs.
(Contract DA 44-177-tc-622)
Unclassified report

DESCRIPTORS: *Thermoelectricity, Alloys, *Solar energy, *Power supplies, *Bibliography, Generators, Materials, Effectiveness, Collecting methods, Upper atmosphere, Design, Spaceships, Satellite vehicles, Lenses, Semiconductors, Intermetallic compounds, Reflectors, Mirrors, Space flight, Propulsion, Electric propulsion.

The simultaneous solutions of two problems is required: (1) solar energy collection and heat sink radiation efficiency must be as high as possible in order to obtain the widest possible temperature difference between the hot and cold junctions of the thermoelectric generator. Using selective absorbing and radiating surfaces on flat-plate collectors, and 10 to 20-fold concentrating collectors, a temperature difference of 200 to 520 C can be reached with a collection efficiency in excess of 50%. (2) thermoelectric efficiency with materials presently available can reach 9% efficiency with a factor of merit Z equal to 0.002 per degree C. With Z equal to 0.004, an efficiency of 19.0% could be attained at 500 C temperature difference. The experimental arrangements proposed for Phase II of this project will use vacuum conditions and a thin plastic Fresnel lens for the concentration of solar radiation to simulate space conditions at variable energy concentration ratios. (Author)

AD-255 364 Div. 7
(4 May 61) OTS price $1.10.

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THERMOELECTROGENERATOR, TYPE TGK-10,
by V. Daniel Bek. Nov 60, 4p. (Trans. no. MCL-144 from Isdatel'stvo DOSAAF, pp. 13-14, Sep 56)
Unclassified report

DESCRIPTORS: *Thermoelectricity, Generators, *Power supplies, Radio receivers, Design, USSR, Radio stations.

Thermoelectrogenerators, type TGK-10, with the power rating of 10-12 w are being produced to supply power to small collective-farm radio centers. Conventional kerogas burners supply heat to these generators. Special thermoelements are used with a comparatively high service-life and efficiency rating. The thermoelectrogenerator has 2 self-contained thermobatteries, one of which provides the power supply to the heating circuits, while the second supplies the power to plate circuits from vibrapack which is installed in the radio center. A total of 410 thermoelements are contained in the generator, of which, 36 constitute the heating battery and 374 the vibrapack battery.

AD-255 375 Div. 7, 4, 25
(4 May 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
TRANSFORMATION OF THE CHEMICAL ENERGY OF FUEL INTO ELECTRICAL ENERGY IN FUEL CELLS (Preobrazovaniye Khimicheskoy Energii Topliva V. Elektricheskuyu V Toplivnykh Elementakh)
by A. G. Pshenichnikov. 26 Oct 60, 20p. incl. table, 12 refs. (Trans no. MCL-401 from Teploenergetika 10:47-51, 1956)
Unclassified report

DESCRIPTORS: *Fuel cells, Energy, Electrochemistry, Theory, Chemical reactions, Electrodes, Materials, Design, Hydrogen, Oxygen, Thermodynamics, *Power supplies.

The advantages and the possible application areas of the hydrogen-oxygen fuel cells at the present time include: (1) a fuller utilization of the energy of fuel than in a heat engine; (2) the ability to carry heavy loads with a reduced efficiency and to yield low-voltage dc promises an application of the hydrogen-oxygen cell in the transportation field; (3) actual absence of moving parts, complete noiselessness, and freedom from vibration; (4) the cell coupled with an electrolyzer can be used as a storage battery, and there is no need to increase the dimensions of the cell with increased amount of energy stored, since hydrogen and oxygen obtained through the electrolysis are stored in tanks; (5) with a power of 1 - 2 kw and more, a cell with tanks will be lighter and more compact than ordinary storage batteries with the same amount of energy stored; (6) the use of the hydrogen-oxygen cell as a storage battery is advisable for storing wind energy; and (7) the efficiency of an electrolyzer-fuel cell couple is 40%. (Author)

AD-255 376 Div. 7, 4, 25
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
STUDY OF FUEL CELLS WITH SOLID ELECTROLYTES (Issledovaniye Toplivnykh Elementov S Tverdymi Elektrolitami)
by V. S. Daniel'bek, M. Z. Mints and others. 24 Oct 60, 16p. incl. illus. 24 refs. (Trans. no. MCL-402 from Trudy Chetvertogo Soveshchaniya Po Elektrokhimii (1-6 Oktyabrya 1956)pp. 794-800, 1959)
Unclassified report

DESCRIPTORS: *Fuel cells, *Electrolytes, Solids, High temperature research, Tests, Thermodynamics, Electrochemistry, Coal, Carbon compounds, Monoxides, Hydrogen, Carbon dioxide, USSR, Power supplies.

Results are given of investigations in the field of fuel cells with solid electrolytes and intended for operation at high temperatures. Thermodynamic calculations of the theoretical values of the maximum efficiency and emf of high temperature fuel cells with coal, CO, and H2 were repeated. New data were added concerning the free energy and heat content of H2O, CO2, and CO. These results confirmed that fuel cells operating on coal or a gas-like fuel from 500 to 1000 degrees can theoretically have high efficiency (up to 100%) with an emf close to 1 volt.

AD-255 377 - Div. 7, 4
(4 May 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE PRESENT-DAY SITUATION IN THE FUEL CELL DEVELOPMENT FIELD (Sovremennoye Sostoyaniye Razvitiya Toplivnykh Elementov) by I. G. Gurevich. 26 Oct 60, 32p. incl. illus. table, 28 refs. (Trans. no. MCL-403 from Inzhenerno-Fizicheskiy Zhurnal 1:75-88, 1958)
Unclassified report

DESCRIPTORS: *Fuel cells, *Bibliography, Theory, Design, Electrochemistry, Oxygen, Hydrogen, Effectiveness, Electrodes, USSR, Power supplies.

A review is made of the development of fuel cells as noted in publications of the last decade. The theory of the fuel cell is discussed as well as the types (direct and indirect, and oxidation-reduction), materials, and the prospects of application.

AD-255 462 Div. 7, 12, 25
(8 May 61) OTS price $8.10.

Electro-Optical Systems, Inc., Pasadena, Calif.
INVESTIGATION OF NEW SOLAR REGENERATIVE FUEL CELL SYSTEMS,
by Frank A. Ludwig. Semi-annual technical summary rept. 1 Jan-30 June 60, 10 July 60, 1v. incl. illus. tables. (EOS rept. no. 420-20-2)
(Contract DA 36-039-sc-85270, Proj. 3A99 09 001)
(ARPA order no. 80-59) Unclassified report

DESCRIPTORS: *Fuel cells, Solar energy, Electric power production, Space flight, Storage, Photoelectric cells, Power supplies, Design, Effectiveness, Tests, Analysis, Thermodynamics, Materials, Dissociation, Reaction kinetics, Heat, Thermal radiation, Theory, Photochemistry, *Solar cells, *Thermoelectricity, Photolysis.

The importance of storage capabilities of a thermally regenerative fuel cell was determined. Detailed analysis points out that the storage capabilities of the thermally regenerative fuel cell are not an especially unique feature and, therefore, over-all analysis may ignore this feature in order to evaluate a general efficiency for thermally regenerative fuel cells. The theoretical efficiency of a thermally regenerative fuel cell was determined by setting up 12 models, and quantitative thermodynamic equations were developed. A kinetic analysis was performed to indicate any chemical dissociation rate problems which may be encountered for systems which looked promising from a thermodynamic standpoint. Electrochemical kinetic parameters (which must be experimentally determined) are also discussed from the standpoint of how they relate to the dissociation kinetics. The general thermodynamic criterion delta F/delta H was chosen for the evaluation of chemical compounds. Of those compounds found attractive from a thermodynamic standpoint, only a few remained attractive after kinetic analysis. A brief analysis of the efficiency of photochemically regenerative fuel cells was made. The experimental data of the H2SO4 vaporization-condensation fuel cell indicates good closed cycle operation at current densities of 20 ma/sq. cm at 0.3 volt. (Author)

AD-255 463 Div. 7, 12
(8 May 61) OTS price $8.10

Electro-Optical Systems, Inc., Pasadena, Calif.
INVESTIGATION OF NEW SOLAR REGENERATIVE FUEL CELL SYSTEMS,
by Frank A. Ludwig. Final rept. 30 Nov 59-30 Nov 60. 30 Nov 60, 1v. incl. illus. tables. (EOS rept. no. 420-Final)
(Contract DA 36-039-sc-85270, Proj. 3A99 09 001)
(ARPA order no. 80-59) Unclassified report

DESCRIPTORS: *Fuel cells, *Power supplies, Solar energy, Photochemistry, Photochemical reactions, Storage, Effectiveness, Design, Tests, Analysis, Theory, Thermodynamics, Dissociation, Reaction kinetics, Materials, Space flight, Electric power production, Heat, Thermal radiation.

New concepts for solar regenerative fuel cells were explored analytically and experimentally. An analytical program to determine the importance of storage capabilities of a thermally regenerative fuel cell pointed out that this feature may be ignored when evaluating the general efficiency. Theoretical efficiency was determined by setting up 12 models. Quantitative thermodynamic equations were developed for most of these, which will serve in solving future experimental problems. A kinetic analysis was performed to indicate any chemical dissociation rate problems which may be encountered for systems which look promising from a thermodynamic standpoint. Electrochemical kinetic parameters are discussed from the standpoint of the dissociation kinetics. The general thermodynamic criterion deltaF/deltaH was chosen for the evaluation of chemical compounds. A brief analysis was made of the efficiency of photochemically regenerative fuel cells. (Author)

AD-255 732 Div. 7, 4, 25
(11 May 61) OTS price $1.60

Polytechnic Inst. of Brooklyn, N. Y.
FUEL CELL AND ITS RELATED TECHNOLOGY. I. CORRELATION BETWEEN MAGNETIC SUSCEPTIBILITY AND CATALYTIC ACTIVITY OF ELECTRODE,
by Ju Chin Chu and S. M. Hu. Bi-monthly progress rept. 16 Jan-15 Mar 61. 15 Mar 61, 14p. incl. illus. table. (Fuel cell rept. no. 10)
(Contract DA 44-009-eng-4586)
Unclassified report

DESCRIPTORS: *Power supplies, *Fuel cells, *Electrodes, *Catalysis, Electrochemistry, *Magnetic susceptibility, *Adsorption, Magnetic properties, Reaction kinetics, Mathematical analysis, Factor analysis, Theory.

Rate equations for chemisorption are analyzed. The transient of magnetic susceptibility and fraction of unoccupied active sites are shown to be related to one another. Rate coefficients for chemisorption are expressed in terms of the magnetic susceptibility change. Necessary information is analyzed and the method of interpretation of data is described in detail. In addition a scheme of factorial experiment design is presented. (Author)

AD-255 733 Div. 7, 4, 25
(11 May 61) OTS price $1.60

Polytechnic Inst. of Brooklyn, N. Y.
FUEL CELL AND ITS RELATED TECHNOLOGY. II. CORRELATION BETWEEN INFRARED SPECTRUM AND CATALYTIC ACTIVITY OF ELECTRODE,
by Ju Chin Chu and W. S. Yu. Bi-monthly progress rept., 16 Jan-15 Mar 61. 15 Mar 61, 7p. incl. illus. table. (Fuel cell rept. no. 11)
(Contract DA 44-009-eng-4586)
Unclassified report

DESCRIPTORS: *Fuel cells, *Power supplies, *Electrodes, *Infrared spectroscopy, Design, *Catalysis, Adsorption, Transmission, Absorption, Infrared spectrophotometers, Electrochemistry, Materials.

Because of the large number of mirrors involved in the reflection technique for measuring the IR spectra of chemisorbed fuel gases, a transmission technique is considered. The method of preparation of the sample is also described. The measurement of chemisorbed gas spectrums has been previously described. Two main experimental difficulties have to be overcome: (1) the adsorbed substance must be present in sufficient quantity for its absorption spectrum to be observable; and (2) the scatter radiation loss should be reduced to as low a value as possible. (Author)

AD-255 734 Div. 7, 4, 25
(11 May 61) OTS price $1.60

Polytechnic Inst. of Brooklyn, N. Y.
FUEL CELL AND ITS RELATED TECHNOLOGY. III. CORRELATION BETWEEN SURFACE CONDUCTIVITY AND CATALYTIC ACTIVITY OF ELECTRODE,
by Ju Chin Chu and Leonard M. Salzarulo. Bimonthly progress rept. 16 Jan-15 Mar 61, 15 Mar 61, 12p. (Fuel cell rept. no. 12)
(Contract DA 44-009-eng-4586)
Unclassified report

DESCRIPTORS: *Fuel cells, *Power supplies, *Electrodes, *Catalysis, *Conductivity, *Surface properties, Electrochemistry, *Catalysts, Preparation, Impregnation, Thin films, Vapor plating, Filaments, Gels, Surface area, Solutions, Vapors.

The function and specificity of catalysts is briefly discussed. The various methods which are available for the preparation of catalysts are given. Each method offers certain advantages and disadvantages which are mentioned. The methods available for preparing catalysts may be divided into three main categories: precipitation methods, impregnation methods, and vacuum evaporation methods. Two types of impregnation may be carried out. In the first method a carrier is impregnated with a solution, while the second procedure involves impregnation with a vapor. The vacuum evaporation method is normally subdivided into two groups: thin film preparation and filament preparation. (Author)

AD-255 919 Div. 7, 25
(16 May 61) OTS price $8.10

Catalyst Research Corp., Baltimore, Md.
AUTOMATICALLY ACTIVATED ZINC SILVER OXIDE BATTERIES,
by Joseph J. Holechek, Paul E. Streigle and others. Quarterly progress rept. no. 2, 1 Oct-31 Dec 60. 31 Dec 60, 81p. incl. illus. tables, 13 refs.
(Contract DA 36-039-sc-85361, Proj. 3G18-03-001-01)
Unclassified report

DESCRIPTORS: *Primary batteries, *Alkaline cells, Zinc, Silver compounds, Oxides, Potassium compounds, Hydroxides, Heat exchangers, Tests, Design, Heat transfer, Thermodynamics, Enthalpy, Electrolytes, Volume, Gas generating systems, Heating, Zinc electrodes, Silver electrodes, Calorimeters, Temperature.

Efforts continued on the basic investigations such as the enthalpy of battery components, electrolyte requirement studies, and studies leading to the formulation of a chemical heat source. Prototype heat exchangers were tested and found to be a feasible means of rapidly heating rapidly flowing electrolyte. Battery block-electrolyte reservoir studies were made to determine the effect of equilibrium temperature and current density on activation. Gas generators or battery initiators were tested to determine whether temperatures in the range of -65 to 165 F would affect gas volume and rate of pressure. A solenoid timer apparatus was designed and constructed for future electrolyte flow rate and temperature studies. (Author)

AD-255 944 Div. 7, 4, 25
(15 May 61) OTS price $3.60

Diamond Ordnance Fuze Labs., Washington, D. C.
CHARACTERISTICS OF OXYGEN ELECTRODES FOR LOW-TEMPERATURE FUEL CELLS,
by I. A. Denison. 24 Apr 61, 35p. incl. illus. 16 refs. (DOFL rept. no. TR-923)
Unclassified report

DESCRIPTORS: *Fuel cells, *Low temperature research, *Oxygen electrodes, *Electrodes, *Power supplies, Electrochemistry, Physical properties, Tests, Design, Preparation, Electrical potential, Carbon, Cathodes (Electrolytic cell), Sintered alloys, Catalysts, Platinum, Ion exchange resins, Electrolytes, Metals.

Available information was assembled and evaluated on the methods of preparation and the physical and electrochemical characteristics of oxygen for electrodes for low-temperature fuel cells. Porous carbon and sintered metal cathodes have been considered with reference to methods of preparation, mode of operation, electrochemical characteristics, and other properties. Such electrodes are capable of operation in strongly alkaline electrolytes at current densities of several hundred amperes per square foot for extended periods of time. Electrodes of noble metals, such as platinized platinum, are used in fuel cells in combination with an acidic or alkaline ion-exchange membrane electrolyte. Because of the slowness with which hydrogen peroxide is decomposed in acid media, fuel cells with acid electroytes do not ordinarily operate at current densities greater than 20 amp/sq ft. (Author)

AD-255 995 Div. 7, 8, 20
(17 May 61) OTS price $3.60

Admiral Corp., Chicago, Ill.
EVALUATION - DEVELOPMENT OF MIL-C-14157 CAPACITORS FOR NUCLEAR RADIATION ENVIRONMENT,
by E. R. Pfaff. May 61, 28p. incl. illus. tables.
(Scientific rept. no. 7)
(Contract NObsr-77612)
Unclassified report

DESCRIPTORS: *Capacitors, *Radiation damage, Propyl radicals, Diphenyl, Cyanates, Tests, Gamma rays, *Dielectric films, Dielectrics.

Six E-200 capacitors survived gamma irradiation tests and were subjected to environmental tests. Two units survived these tests. Half of the E-200 units in the control test failed within two hours. All of the inhibited oversized monoisopropylbiphenyl units failed in the gamma-temperature environment; however, they survived for a longer period of time than the standard CPM08 capacitors. Some of the isocyanate treated Mylar and the Samica units were received and testing of these units was started. (Author)

8. ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-255 001 Div. 8
(1 May 61) OTS price $5.60

David Sarnoff Research Center, Princeton, N. J.
LOW-NOISE MICROWAVE TUBES,
by S. Bloom, J. Berghammer and others. Semi-annual rept. no. 1, 1 Aug 60-30 Jan 61. 15 Mar 61. 1v. illus.
(Contract DA 36-039-sc-87393, Proj. no. 3-99-15-504)
Unclassified report

DESCRIPTORS: *Electron tubes, *Noise (Radar), *Noise (Radio), Reduction, Microwave equipment, *Electron beams, Plasma physics, *Cathodes (Electron tubes), *Traveling wave tubes, Space charges, Cesium, *Electron guns, Noise generators, Theory, Mathematical analysis, Damping.

Research is concerned with the investigation of new techniques for the reduction of noise on electron beams with particular emphasis on beams extracted from plasma-type cathodes. A plasma cathode, employing a beta-eucryptite coated hairpin and an L-cathode, was incorporated into a TWT. A new slit-feed system was developed for controlled feeding of cesium vapor into the space-charge-neutralized hollow cathode and construction of a TWT employing this second variety of plasma cathode was initiated. The SpiF apparatus was completed and initial tests showed the apparatus to be in proper working order. Studies of space charge instability effects in low noise guns continued. An analysis of reactive damping of space charge waves in a multivelocity beam is presented. A good analytical representation of the kinematic current in a drifting, Maxwellian beam was obtained. An estimate was made of the effects of distributed Nyquist noise generators due to circuit loss on TWT noise factor. (Author)

AD-255 008 Div. 8, 7, 25
(1 May 61) OTS price $1.10

Texas Instruments, Inc., Dallas.
PELTIER COOLING OF SEMICONDUCTOR COMPONENTS,
by Bob Carey and Raymond Marlow. Monthly progress rept. no. 10, 1 Mar-15 Apr 61. 15 Apr 61, 2p.
(Rept. no. 10-45800-10)
(Contract NObsr-81204)
Unclassified report

DESCRIPTORS: *Semiconductors, *Transistors, *Cooling, Thermoelectricity, Instrumentation, Heat transfer, Containers, Tests.

An evaluation was made of a Peltier cooler designed for a 2N1038 transistor, which dissipates 20 watts of power at room temperature, and is derated linearly to 0 watts at 100 C. Initial test results show a transistor case temperature of 9 C when the hot junction operates at 42 C and the transistor dissipates 10 watts of thermal power. The heat flux at the hot junction is high, and the amount of cooling attainable with this type of Cooler will be dependent on the efficiency of the heat sink used. A cooler with 5 junctions was evaluated using the finned heat sink. Both natural and forced convection means were used to transfer the heat from the hot junction to the ambient on this cooler. The transistor case temperature was approximately 40 C cooler with the Peltier cooler than without the cooler under the same cooling mechanism. (Author)

AD-255 071 Div. 8
(3 May 61) OTS price $4.60

Ramo-Wooldridge Div., Thompson Ramo Wooldridge Inc., Canoga Park, Calif.
VEHICULAR ANTENNA RESEARCH IN THE HF REGION,
by Roger R. Trapp. Final rept. 1 July 59-30 June 60. 28 Sep 60, 1v. incl. illus. (Rept. no. C84-0U20)
(Contract DA 36-039-sc-78936)
Unclassified report

DESCRIPTORS: Antennas, *Vehicle antennas, High frequency, Medium frequency, Design, *Conical antennas, *Antenna radiation patterns, Cargo vehicles, Broadband, Radio equipment, Impedance, Tests, Effectiveness.

Investigations continued on vehicular antennas in the h-f region from 1.5 mc to 20 mc. An experimental model 15 foot HF antenna was designed which compared favorably with the existing standard whip of the same height. This antenna, which is a conical design simulated with four whips, provided an increased impedance bandwidth, a greater power handling capability, and an increase in radiation efficiency by comparison with the standard whip. Satisfactorily omnidirectional radiation patterns were obtained with an orthodox mounting location on a 3/4 ton weapons carrier carrying an equipment shelter. (Author)

AD-255 077 Div. 8
(3 May 61) OTS price $2.60

Transco Products, Inc., Los Angeles, Calif.
DEVELOPMENT OF TYPE B: HIGH-SPEED UHF-BAND ANTENNA.
Interim rept. no. 2, 1 Oct-31 Dec 60. 31 Dec 60, 20p. incl. illus.
(Contract NOw 60-0144-c)
Unclassified report

DESCRIPTORS: Ultra high frequency, L band, *Antennas, *Airplane antennas, Communication systems, Radio communication systems, Supersonic planes, Radio navigation, Identification systems, Antenna radiation patterns, Impedance, Measurement, Design.

The design of an UHF external blade antenna for high speed aircraft is described. The design is a variation of the L band external blade antenna developed previously. The antenna is a new type that is all-metal above the surface on which it mounts. It is conductively connected to the surface by a metal bar that also provides structural support for the blade. RF performance of the first developmental model is described by measured radiation patterns made on flat metallic ground planes. The planned application of the new design in combination UHF and L band antennas, and in special UHF antennas, is described. (Author)

AD-255 120 Div. 8
(2 May 61) OTS price $4.60

Kidde, Walter, and Co., Inc., Belleville, N. J.
STATIC SWITCHING DEVICES,
by Robert Langfelder and Richard Gilbert. Quarterly progress rept. no. 5, 1 Nov 60-31 Jan 61. 31 Jan 61, 33p. incl. illus., tables (Rept. no. 2202-Q5)
(Contract DA 36-039-sc-85240)
Unclassified report

DESCRIPTORS: *Switching circuits, Diodes, Teletype equipment, *Oscillator circuits, *Electronic switches, *Electronic relays, *Electronic circuits, Semiconductors, Tests, Oscillators, Design, Transistors.

An analysis of the operation and the design of the signal circuit of a single-pole double-throw current relay is presented. The schematic of the complete relay is given and the results obtained are discussed. Results obtained with some circuits considered for use as the drive circuit of a symmetrical transistor signal switching circuit are discussed. (Author)

AD-255 126 Div. 8
(2 May 61) OTS price $2.60

Microwave Associates, Inc., Burlington, Mass.
VARACTOR DIODE INDUSTRIAL PREPAREDNESS MEASURES,
Quarterly progress rept. no. 2, 25 Sep-24 Dec 60. 24 Dec 60, 12p. illus.
(Contract DA 36-039-sc-85941)
Unclassified report

DESCRIPTORS: Microwave equipment, *Diodes, *Variable capacitors, *Microwave amplifiers, Industrial production, Manufacturing methods, Reliability, Packaging, Tests, Design.

Background information on the development of the varactor diode is presented. A brief description of the device and device design parameters are included. General considerations were made concerning the fabrication process and equipment used at the inception of the contract. The design and development of the improved varactor package assembly process are described in detail. The semi-automation of the process and improved hermetic package reliability obtained through the process are explained. Results of reliability tests comparing the improved package assembly process with the process used at the inception of the contract are given. These results indicate that the improved package assembly process is a superior method of obtaining hermetically sealed packages. The work done to improve the operation of the controlled atmosphere bakeout line is explained. As a result of this work the dew point of the controlled atmosphere chamber was lowered from -20 to -30 C. (Author)

AD-255 135 Div. 8
(2 May 61) OTS price $2.60

Naval Research Lab., Washington, D. C.
CURVES OF ATMOSPHERIC-ABSORPTION LOSS FOR USE IN RADAR RANGE CALCULATION,
by L. V. Blake. Final phase rept. 23 Mar 61, 24p. incl. illus. tables (NRL rept. no. 5601)
Unclassified report

DESCRIPTORS: *Radar signals, Attenuation, Atmosphere, Absorption, *Radio waves, *Radar ranges, *Radio ranges, Very high frequency, Ultra high frequency, Superhigh frequency, Mathematical prediction, Theory, Humidity, Oxygen, Microwave equipment, Determination, *Atmospheric refraction, *Wave transmission, Water vapor, Propagation.

The attenuation of radar signals due to absorption by atmospheric oxygen and water vapor was calculated for a surface-based radar as a function of the target range and elevation angle, for frequencies in the range 100 to 10,000 mc, employing the theory of Van Vleck. The results are presented in the form of curves that are especially adapted to use in calculating radar maximum range. Limitations of the theory, particularly in the assignment of values to the line-breadth factors and in the details of the collision-broadening formulas are discussed. It was concluded that these limitations are not likely to produce serious errors. Comparison is made with attenuation calculations made by others for ray paths through the entire atmosphere. (Author)

AD-255 147 Div. 8, 25
(4 May 61) OTS price $5.60

Airborne Instruments Lab., Inc., Mineola, N.Y.
DESIGN OF A MOLECULAR AMPLIFIER GROUP,
by S. Okwit, F. Arams, and J. G. Smith. Rept. for Apr-June 59. Aug 59, 49p. incl. illus. table, 14 refs. (Rept. no. 5945-1)
(Contract AF 33(600)38862, Proj. 4107)
(WADC TN 59-392, pt. 1) Unclassified report

DESCRIPTORS: Amplifiers, *Microwave amplifiers, Traveling wave tubes, Ultra high frequency, Diodes, Noise (Radio), Electron beams, Paramagnetic crystals, Refrigeration systems, Analysis, Design, Packaging.

The research objective is to design, construct, and test a molecular amplifier group for low-noise amplification in the 2150 to 2350 mc band. The requirements for this amplifier are: (1) a noise factor of less than 0.5 db, (2) a gain greater than 20 db, (3) a bandwidth of at least 4 mc, and (4) ease of tuning over the 2150 to 2350 mc band. The reactance amplifier, the electron beam parametric type amplifier, the mavar (ferromagnetic amplifier), and the solid-state maser were investigated for best system characteristics. The traveling-wave maser was selected as the receiver configuration that will best meet the requirements. Slow-wave techniques for the traveling-wave maser are discussed. Using this technique slowing factors greater than 100 can be achieved over the required bandwidth. Open and closed refrigerating systems, and tentative system packaging techniques are presented. (Author)

AD-255 148 Div. 8, 25
(4 May 61) OTS price $4.60

Airborne Instruments Lab., Inc., Mineola, N. Y.
DESIGN OF A MOLECULAR AMPLIFIER GROUP,
by S. Okwit, F. Arams, and J. G. Smith. Rept. for June 59-Apr 60. June 60. 35p. incl. illus. tables, 12 refs. (Rept. no. 5945-2)
(Contract AF 33(600)38862, Proj. 4107)
(WADC TN 59-392, pt. 2) Unclassified report

DESCRIPTORS: Amplifiers, *Microwave amplifiers, Ultra high frequency, Traveling wave tubes, Ruby, Crystals, Magnetic fields, Yttrium, Iron, Garnet, *Paramagnetic crystals, Design, Mathematical analysis, Ferrites, Tests, Noise (Radio), Paramagnetic resonance.

A traveling-wave maser (TWM) using a ruby crystal in a 1-7/8 inch long slow-wave comb structure was operated successfully. Operation is most efficient when the external magnetic field is oriented at an angle of 90 degrees with respect to the C-axis. A 0-degree C-axis crystal was used instead of the standard 60-degree C-axis crystal. This resulted in a considerable improvement in gain for the rf circuit geometry used. The final breadboard maser configuration yielded an average electronic gain of approximately 5 db per inch from 2150 to 2350 mc at a bath temperature of 1.8 K. Unidirectional loss

was successfully incorporated in the maser by using polycrystalline yttrium iron garnet (YIG) disks. The t/d ratio required for coincidence of the d-c magnetic fields for ferrimagnetic resonance and for maser action was determined. Isolator reverse loss varies from 4.0 db/in. at the low-frequency end of the band to 8.5 db/in. at the high-frequency end. The figure of merit for the isolator is about 20. (Author)

AD-255 187 Div. 8
(3 May 61) OTS price $5.60

Electronics Research Lab., U. of Calif., Berkeley.
STUDY OF CROSSED-FIELD AMPLIFIERS,
by J. R. Whinnery, C. K. Birdsall and others. Quarterly progress rept. no. 4, 1 Nov 60-31 Jan 61. 28 Feb 61, 46p. incl. illus.
(Contract DA 36-039-sc-85278)
Unclassified report

DESCRIPTORS: *Microwave amplifiers, Amplifiers, Electron beams, Space charges, *Diodes, Measurement, *Backward-wave amplifiers, Noise (Radio), Reduction, Theory, Mathematical analysis, Electron guns, Transformations (Mathematics).

Research is concerned with the identification and reduction of beam noise input. An approximate estimate of the space-charge spread in a crossed-field diode agreed with the spread in the beam observed during velocity-distribution measurements. A transformation of fluctuations which is applicable to a crossed-field diode is presented. This transformation gives the fluctuations measured at any arbitrary exit plane. The choice of the exit plane is also discussed. Using the transformation the noise in a grid wire near the cathode is calculated. The noise figure of a backward-wave amplifier is calculated using the small-signal theory of Gould. The measured noise figures are found to be about 8 db less than those calculated. A recent approximate analysis of the effect of the potential minimum on noise, by J. R. Whinnery, is discussed, and the formulation expanded and corrected. Expressions for the noise-reduction factor are developed in the time and frequency domains. The results are compared and presented in a form suitable for computation. (Author)

AD-255 188 Div. 8, 2, 30
(3 May 61) OTS price $2.60.

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
A STUDY OF SPREAD F,
by W. K. Klemperer. Final rept. Oct 60, 19p. incl. illus. 10 refs. (Rept. no. RA-1319-P-3)
(Contract AF 19(604)5460)
(AFCRL-243) Unclassified report

DESCRIPTORS: *Radar reflections, Ionosphere, *Angle of arrival, *Radio waves, Reflection, Scattering, Interferometers, Measurement, Spectrographic analysis, *Radar signals, *Radio signals, *Radio astronomy, *Radio interferometers,

A study was made of high frequency radar reflections from the ionosphere. Of primary interest was the study of spread F (a night-time echoing condition giving diffuse radar returns over a considerable range interval). A scheme for determining the spread in angle of arrival of radio waves under spread F conditions was devised, and a few measurements were made. In addition, information about the nature of reflection and scattering from the ionosphere during spread F was obtained by analysis of probability density distributions and power spectra. In conjunction with a radio astronomy program at Cornell University, simultaneous data were taken to relate the occurrence of spread F with radio star scintillation. A marked positive correlation between the two events was observed. Equipment for determining ionospheric drift velocities during spread F was installed and theoretical work on the subject of scattering near the level of reflection in the ionosphere was initiated. (Author)

AD-255 222 Div. 8, 5, 15
(3 May 61) OTS price $2.60

Columbia U., New York.
SOME REMARKS ON THE CAPACITY OF COMPOUND CHANNELS IN THE SEMICONTINUOUS CASE,
by Harry Kesten. Technical rept. 1 Apr 61, 21p.
(Contract Nonr-26604; In cooperation with Hebrew U. (Israel))
Unclassified report

DESCRIPTORS: *Information theory, Coding, *Communications theory, Transmission, Probability, *Multiplex transmission.

AD-255 236 Div. 8
(4 May 61) OTS price $10.50

Pacific Semiconductors, Inc., Culver City, Calif.
RESEARCH AND DEVELOPMENT OF HIGH-POWER SILICON TRANSISTORS.
Rept. for 7 June 57-30 June 60. Nov 60. 125p. incl. illus. tables.
(Contract AF 33(600)35088, Proj. 4159)
(WADD TR 60-802) Unclassified report

DESCRIPTORS: *Transistors, *Radiofrequency amplifiers, *Radiofrequency oscillators, Silicon, Triodes, Design, Manufacturing methods, Production, *Switching circuits, Electronic circuits, Circuits, Semiconductors, Materials, Single crystals, Power amplifiers.

A survey was made of semiconductor devices which might be useful as power amplifiers. It is concluded that the triode transistor is presently the best choice. The design theory for such power transistors is described. A survey of possible semiconductor materials is given, with the conclusio that silicon is by far the best choice. A process is described for fabrication of this family of very high power transistors. The basic structure is an n^+-p-n-n^+ triply-diffused silicon transistor with interdigitated (comb) emitter and base-contact layers produced photographically. A simple scaling principle is employed to make a variety of transistors with a wide range of current and power ratings. A description of tests and their results are given for 30 transistors of each type delivered to the Wright-Patterson Air Development Division. These transistors present a number of manufacturing problems, particularly in the larger sizes. (Author)

AD-255 239 Div. 8, 30
(3 May 61) OTS price $3.60

Levinthal Electronic Products, Palo Alto, Calif.
SUPER-POWER KLYSTRON TUBE-TEST FACILITY,
by Harry G. Heard. Quarterly rept. no. 1,

1 Sep-31 Dec 60. 31 Dec 60, 21p. incl. illus. (Rept. no. G-108-Q1)
(Subcontract to Varian Associates, Palo Alto, Calif., Contract DA 36-039-sc-85350)
Unclassified report

DESCRIPTORS: *Klystrons, *Triodes, Electron tubes, *Test facilities, Design, Power supplies, *Switching circuits, *Modulator tubes, Cooling, Capacitors, *Electronic circuits, Pulse generators, Design, Pulse transformers, Circuits.

This report includes:
DEVELOPMENT OF A 350-KV, 25-AMPERE PULSE TRIODE, by H. Langer and C. V. Weden. Quarterly rept. no. 1, 1 Nov-31 Dec 60. 31 Dec 60, 7p. incl. illus.
(Subcontract to Varian Associates, Palo Alto, Calif., Contract DA 36-039-sc-85350)

Research concerns the development of a super-power klystron test facility. Present major effort on the tube-test system was related to design of the interim modulator, the switch tubes, the main beam supply, capacitor bank and crowbar, cooling system, the control console, and over-all system layout. Efforts are also presented on the development of a triode capable of 350-kv dc hold-off voltage and 25 amp pulse plate current for use as switch tube in pulse modulator circuits. A tentative layout of the required tube is shown. (Author)

AD-255 275 Div. 8, 26
(27 Apr 61) OTS price $2.60

Raytheon Mfg. Co., Newton, Mass.
INDUSTRIAL PREPAREDNESS STUDY ON TRANSISTORS. SILICON VIDEO AMPLIFIER (DEVICE 25),
by John Sardella, Frank M. Dukat and others.
Quarterly rept. no. 12, 12 June-11 Sep 60.
11 Sep 60, 17p. incl. tables.
(Contract DA 36-039-sc-72710)
Unclassified report

DESCRIPTORS: *Transistors, Silicon, Tests, Industrial production, Manufacturing methods, Processing, Production, Military requirements, *Quality control, *Video amplifiers, Standardization, Machining.

Several important improvements in technique in the government pilot line were implemented. Mechanical and electrical yields were greatly improved, as a result. The use of pretinned emitter and basewhiskers which are subsequently retinned gave stronger bonds between the whiskers and their respective electrodes. A greater degree of uniformity of base ring solder wetting and penetration was attained through the use of heavy steel weights which secure the base ring during the firing cycle. Mechanical and electrical yields were improved. Chip material of higher post-diffused resistivity were adopted as standard. The result of this action was fabrication of units with a lower Rb Cc product. A higher yield of units meeting the 6 mc hfe specification was obtained by increasing the emitter dot volume by 20%. Three thousand I.P.S. samples were manufactured during this period. (Author)

AD-255 276 Div. 8, 26
(27 Apr 61) OTS price $3.60

Raytheon Mfg. Co., Newton, Mass.
INDUSTRIAL PREPAREDNESS STUDY ON TRANSISTORS. SILICON VIDEO AMPLIFIER (DEVICE 25),
by John Sardella, Frank M. Dukat and others.
Quarterly rept. no. 13, 12 Sep-6 Oct 60, 6 Oct 60, 27p. incl. tables.
(Contract DA 36-039-sc-72710)
Unclassified report

DESCRIPTORS: *Transistors, Silicon, *Video amplifiers, Industrial production, Military requirements, Manufacturing methods, Production, Processing, *Quality control, Tests, Life expectancy, Standardization, Machining.

Final testing of 3000 I.P.S. samples was completed. Results are summarized for Group A, Group B and Group C tests performed on 150 Device 25 units. Data showing all parameters for individual units is presented. In addition to the prescribed tests, an operating life test was performed on 50 units and the data obtained from it is included. (Author)

AD-255 281 Div. 8, 26
(4 May 61) OTS price $7.60

General Telephone and Electronics Labs., Inc., Bayside, N. Y.
STUDIES OF ELECTRON TUBE MATERIALS AND THERMIONIC EMISSION PROCESSES.
Scientific rept. no. 3, 1 Oct-31 Dec 60.
31 Jan 61. 1v. incl. illus. tables. (Rept. no. TR60-704-104-204-205-208.6)
(Contract AF 19(604)7286)
(AFCRL-17) Unclassified report

DESCRIPTORS: *Electron tubes, Materials, *Thermionic emission, Diodes, Nickel, Tungsten, Aluminum compounds, Oxides, Electron microscopy, Zone melting, Oxide cathodes, *Cathodes (Electron tubes), Design.

STUDIES OF THE PROPERTIES OF ULTRAPURE NICKEL: A series of tests were undertaken on Pt cathodes to compare the pulsed emission levels of Pt-based diode cathodes processed in conventional oil diffusion pump systems and in an oil-free vacuum system. The solvent extraction process for the removal of traces of Fe from Ni by chelate extraction with acetylacetone was investigated by using radioactive Fe-59. TUNGSTEN-ALUMINA REACTION STUDY: Operation of the mass spectrometer with full Knudsen cell ion source instrumentation provided a tentative measure of the over-all absolute sensitivity of the present instrumentation in terms of (1) the resolved ion current received at the mass spectrometer ion collector per partial pressure unit, and (2) the particular isotope in focus, in the Knudsen cell. ELECTRON EMISSION MICROSCOPY: The recrystallization phase of cold worked Ni 220 cathode alloy was demonstrated with the emission microscope activating the surface by dip coating in barium formate to obtain a thin layer of Ba of controlled thickness.

AD-255 282 Div. 8
(4 May 61) OTS price $2.60

Hughes Aircraft Co., Culver City, Calif.
STUDY OF LOW-NOISE MICROWAVE TUBES - NEW APPROACHES TO THE LOW-NOISE PROBLEM,
by M. R. Currie, D. C. Forster, and J. W. Hansen.
Quarterly rept. no. 3, 15 Dec 60-14 Mar 61, on A Study of the Problem of Noise on Electron Beams.
14 Mar 61, 27p. incl. illus.
(Contract DA 36-039-sc-85354)
Unclassified report

DESCRIPTORS: *Microwave equipment, *Electron tubes, *Noise (Radar), *Noise (Radio), Reduction, Electron beams, S band, *Electron guns, Direct current, Theory, Sources, Mathematical analysis, Design, Magnetic fields, K band, Microwave amplifiers, Backward wave amplifiers, *Cathodes (Electron tubes), Measurement.

Emission from the side and corner of the cathode in the Hughes low-noise gun is analyzed to determine the effects of the axial velocity distribution on the noise performance. Both analyses predict a reduction in the noise parameter S sufficient to account for a significant amount of the observed noise reduction. The progress made on the program for measuring the frequency dependence of noise in the beam of the low-noise gun is reviewed and observation of a dip in noise figure at 1340 mc in the PAL tube is reported. Continuing studies of limiting current effects in the low-noise gun are described which tend to establish more firmly a correlation between these effects and both low-noise operation and dc gun characteristics. (Author)

AD-255 287 Div. 8, 12
(4 May 61) OTS price $10.50

Lockheed Aircraft Corp., Sunnyvale, Calif.
STUDY AND DESIGN OF UNFURLABLE ANTENNAS,
by J. R. Barewald, A. T. Cole and others. Final rept. Nov 60, 138p. incl. illus. tables, 14 refs.
(Rept. no. LMSD-704036, vol. 2)
(Contract AF 33(616)6022, Proj. 6278)
(WADD TR 61-26, vol. 2) Unclassified report

DESCRIPTORS: Space environmental conditions, *Satellite vehicle antennas, *Antennas, *Satellite vehicles, Design, *Spaceships, Communication systems, *Parabolic antennas, Antenna radiation patterns, Helixes, *Conical antennas, *Helical antennas, Reflectors.

An unfurlable antenna is most broadly described as a device which can be unfolded to form a large antenna. Research was concerned with the design of unfurling antennas for satellites and other space vehicles where compactness and low weight are necessary during the launching of the vehicle. A number of relatively large antennas were shown to be suitable for use on space vehicles. As various matters were studied, patterns formed which suggested the probable future forms of unfurlable space-vehicle antennas. A series of demonstration models was built to show the feasibility of construction techniques and types of radiators suggested by the theoretical studies. Basic data influencing antenna design are presented, followed by conclusions about their effect on antenna design. From this emerges a series of ideal antenna designs which is, to a large extent, realized in the series of demonstration models. These models and their test results are described and related to the basic investigations. (Author)

AD-255 300 Div. 8
(4 May 61) OTS price $7.60

Stanford Electronics Labs., Stanford U., Calif.
TUNABLE FERRITE CORRUGATED WAVEGUIDE FILTERS,
by N. Crane. 14 Mar 61, 64p. incl. illus.
(Technical rept. no. 510-1)
(Contract DA 36-039-sc-78296)
Unclassified report

DESCRIPTORS: *Waveguide filters, Ferrites, *Waveguides, Tuning circuits, Magnetic fields, Propagation, Tests, Theory, Ferromagnetic materials, Ferroelectric crystals, Waveguide slots.

Work on tunable corrugated waveguide filters is described. Corrugated waveguide filters are basically stopband structures with the waveguide acting as a high-pass filter. There were two approaches taken in the design of the tunable corrugated waveguide filter. In the first approach, only the slots incorporated ferrite. In the second approach, the complete structure was filled with ferrite. A corrugated ferrite filter designed with a stopband that covered the frequency range of X-band waveguide was attempted. In the investigation of ferrite filters, an interesting ancillary development was the ferrite waveguide. This structure, a completely filled rectangular waveguide, exhibits a magnetically tunable high-pass filter characteristic. (Author)

AD-255 302 Div. 8, 26
(4 May 61) OTS price $2.60

Union Thermoelectric Corp., Chicago, Ill.
ULTRAMINIATURE QUARTZ CRYSTAL UNITS,
by John G. Deininger and Roger E. Bennett. Quarterly progress rept. no. 3, 15 Dec 60-14 Mar 61. 14 Mar 61, 23p. incl. illus. tables.
(Contract DA 36-039-sc-85348)
Unclassified report

DESCRIPTORS: *Quartz crystals, Test methods, *Quartz resonators, Manufacturing methods, *Subminiature electronic equipment, Design, Production, Tests, Impedance, Frequency, Test equipment.

Ultraminiature quartz resonators, having diameters of 0.070 and 0.100 inch, have been fabricated and tested. The experimental units covered the frequency range from 10 to 100 mc. A method of contouring ultraminiature plates, and a method and instrument for measuring the Q of high impedance crystal units are discussed. (Author)

AD-255 304 Div. 8, 25
(4 May 61) OTS price $2.60

Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATIONS OF RARE-EARTH OXIDE CATHODES,
by J. B. Baker and G. B. Gaines. Final rept. 1 May 59-31 Mar 61. 31 Mar 61, 24p. incl. illus. tables.
(Contract AF 19(604)5691)
(AFCRL-183) Unclassified report

DESCRIPTORS: *Rare earths, *Oxide cathodes, Mixtures, Materials, Metals, Tantalum, Molybdenum, Tungsten, Rhenium, Refractory materials, *Neodymium compounds, Oxides, *Gadolinium compounds, *Thermionic emission, *Cathodes (Electron tubes).

High thermionic-emission levels were obtained from gadolinium oxide and from a mixture of 75 Nd_2O_3 - 25 Gd_2O_3 but special activating procedures were required to accomplish this. The emission properties of the oxide mixtures differed for various refractory-metal bases with the highest emission currents being obtained with tantalum bases. The presence of carbon in the coating of a cathode composed of the 75 Nd_2O_3 - 25 Gd_2O_3 mixture resulted in higher activation than was obtained without the carbon. Gadolinium oxide gives higher emission than thorium oxide in the temperature range of 1200 to 1500 C. (Author)

AD-255 315 Div. 8
(5 May 61) OTS price $1.60

Electronics Research Lab., U. of Calif., Berkeley.
(No title).
Final technical rept. 1 Dec 59-28 Feb 61.
31 Mar 61, 16p. incl. illus.
(Contract Nonr-22274)

Unclassified report

DESCRIPTORS: *Microwaves, *Electromagnetic waves, Propagation, Scattering, Conical bodies, Ferrites, *Antennas, *Electronic scanners, *Magnetic fields, *Waveguide irises, Waveguide slots, *Electromagnetic theory, *Electronic circuits, *Amplifiers, Feedbacks, *Switching circuits, *Oscillators, *Diodes, *Semiconductors, *Transistors, *Microwave equipment.

Contents:
Radiation and propagation
Back-scattering from cones
Scattering from multiple targets
Scattering from materials with gyrotropic media
Radiation from a modulated ferrite traveling-wave antenna
Ferrite field-displacement device for slot-coupling control
Diffraction studies
Network theory
Bounds on natural frequencies of linear active networks
Gain-bandwidth limitation study of active devices
Active network synthesis
Electronic circuit research
Low-pass amplifiers
Feedback amplifiers
Transistor flip-flop studies
Active RC network synthesis
Nonlinear oscillator studies
Nonlinear semiconductor device circuitry
Block-diagram representation of junction diodes and transistors
Transistor class-C oscillators
Microwave antenna systems and materials
Antenna arrays from a data-processing viewpoint
Organic semiconductors as microwave components

AD-255 325 Div. 8, 25
(5 May 61) OTS price $1.60

Republic Aviation Corp., Farmingdale, N. Y.
MEASUREMENT OF CAPACITOR CHARGING EFFICIENCIES UTILIZING RAMP AND SPIKE CHARGING VOLTAGES,
by D. Rigney, C. Cavalconte and others.
19 Jan 61, 11p. incl. illus. (Rept. no. PPL-TR-61-2(257))
(Contract Nonr-285100)

Unclassified report

DESCRIPTORS: *Capacitors, Measurement, Plasma jets, Resistance, Voltage, Circuits, *Electrostatic capacitance, Electric potential, *Electrical networks.

Application of a ramp input voltage to a series RC network permits the capacitor to be charged with an efficiency approaching 100%. Through use of an integrating circuit, an approximation to a ramp input was generated, and efficiencies approaching 100% were demonstrated. Spike input voltages were investigated, and it was found that the energy input is not utilized efficiently for this case. (Author)

AD-255 342 Div. 8
(5 May 61) OTS price $4.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
ELECTROMAGNETIC THEORY OF SPIN WAVE RESONANCE,
by M. H. Seavey, Jr. 15 Feb 61, 48p. incl. illus. tables, 16 refs. (Technical rept. no. 239)
(Contract AF 19(604)7400)

Unclassified report

DESCRIPTORS: *Electromagnetic theory, Resonance, Magnetic films, *Thin films, Propagation, Nickel alloys, Iron alloys, Spin, Microwave frequency, Mathematical analysis.

An electromagnetic theory of spin wave resonance is given which applies mainly to situations in which DC magnetic field is perpendicular to the planar surface of a medium. The consequence of introducing the exchange anisotropy field into the equation of motion are worked out. It is first shown that, in general, two resonant modes of propagation exist in the perpendicular case and that one of these modes is a spin wave. The degree of excitation of the spin wave mode is shown to depend on the boundary condition, e.g., whether the spins are pinned or unpinned at the surface. The theory is then applied to a semi-infinite medium metal and approximate permeability expressions are obtained. Evidence is presented for a large normal surface anisotropy. Finally, spin wave resonance in a thin film is discussed and a phenomenological model of the process is described. Approximate permeability expressions are obtained and exact theoretical spin wave resonance curves are discussed and compared briefly with experiment. (Author)

AD-255 346 Div. 8, 26
(5 May 61) OTS price $3.60

Transitron Electronic Corp., Wakefield, Mass.
PRODUCTION ENGINEERING MEASURE ON SILICON HIGH FREQUENCY POWER TRANSISTOR,
by P. De Beurs. Quarterly rept. 1 Oct-31 Dec 60.
31 Dec 60, 36p. incl. illus. tables.
(Contract DA 36-039-sc-81286)

Unclassified report

DESCRIPTORS: Silicon, *Transistors, High frequency, Radiofrequency power, Industrial production, Production, Design, *Manufacturing methods, *Radiofrequency power amplifiers, Measurement, Processing.

A threaded study copper package was developed which brought the thermal resistance down to approximately 8C per watt. Process improvements were carried out in areas such as emitter to base diode performance, heavier emitter, and base evaporated layers. The number of good performing transistors increased considerably although major improvements on leakage must be made to increase the yield. Included is a study of the transistor as a power amplifier and the parameters affecting its performance. A list of measurements is also included and where relevant, the plotting of various parameters versus the RF power was performed. (Author)

AD-255 471 Div. 8, 1, 5, 19
(8 May 61) OTS price $4.60

Mississippi State U., State College.
THE DESIGN AND DEVELOPMENT OF TWO INTERNALLY

MOUNTED VHF AIRCRAFT ANTENNAS,
by Homer H. McCown. 1 Apr 61, 37p. incl. illus.
(Research rept. no 32)
(Contract Nonr-97891)
Unclassified report

DESCRIPTORS: Very high frequency, Antennas, Antenna radiation patterns, *Airplane antennas, *Air traffic control systems, Navigation, Transmitter receivers, *Radio communication systems, *Radio navigation, Airborne, Design, *Loop antennas, *Liaison planes, *Scout planes.

A study was made to develop general methods of design of VHF aircraft antennas and to apply these methods to the design of antenna systems in specific aircraft. Most existing antennas which are suitable as far as electrical performance is concerned are external types, causing considerable drag. Conversely, the flush types generally have poor electrical characteristics. The loop and trombone design antennas were studied. Results indicated that the loop antenna is the most satisfactory for general purpose applications. There was little difficulty encountered in adapting either antenna for operation on the Navion aircraft. (Author)

AD-255 488 Div. 8
(7 May 61) OTS price $1.60

ITT Federal Labs., Fort Wayne, Ind.
IMPROVED BARRIER-GRID STORAGE TUBE,
by J. M. Abraham. Quarterly progress rept. no. 3, 1 Oct-311 Dec 60. 31 Dec 60, 12p. incl. illus.
(Serial no. 3109)
(Contract DA 36-039-sc-78953)
Unclassified report

DESCRIPTORS: *Storage tubes, *Electron tubes, Secondary emission, Test equipment, Design, Amplifiers, Signal-to-noise ratio, Tests, Electron guns, Electrodes.

Three experimental tubes were built, each having a different collector-amplifier configuration. The structure selected for pilot production is the rectangular design having a dynode with equal sides. Tooling required for tube fabrication was completed and tube production started. Test equipment system checkout is continuing. (Author)

AD-255 509 Div. 8
(9 May 61) OTS price $26.00

Electromagnetics Lab., Stanford Research Inst., Menlo Park, Calif.
DESIGN CRITERIA FOR MICROWAVE FILTERS AND COUPLING STRUCTURES,
by G. L. Matthaei, P. S. Carter, Jr. and others. Final rept. Jan 61, 577p. incl. illus. tables, 150 refs.
(Contract DA 36-039-sc-74862)
Unclassified report

DESCRIPTORS: *Microwave equipment, Theory, *Waveguide filters, *Low pass filters, *Band pass filters, *Radiofrequency filters, *High pass filters, *Electronic circuits, Transmission lines, Coupling circuits, Printed circuits, Switching circuits, Mathematical analysis, Design, Impedance matching.

Research was concerned, both theoretically and experimentally, with new types of microwave filters and coupling structures, and with developing more precise methods of design for various previously known structures. Among the structures discussed are a wide-band, strip-line, Magic-T; a ferrite-loaded nonreciprocal TEM-mode structure for wide-band gyrator and isolator applications; and two types of forward-coupling hybrid junction, one in strip-line and one in trough guide. Design data are presented for broadside-coupled strip transmission lines, and for an interleaving, printed-circuit, parallel-coupled, strip-transmission-line construction. Design theory and experimental results are presented for a type of waveguide filter having unusually broad stop bands. A generalized description is given of Cohn's method for design of direct-coupled, bnad-pass filters. A method is presented for the design of wide-band, band-pass filters from lumped-element, low-pass prototypes. A mathematical study was made of the design of diplexers. The effects of dissipation loss in filters are presented. The use is discussed of pumped, variable-capacitance diodes in up-converters to form filters whose pass-band frequency is controlled by a voltage-tunable pump oscillator. Lumped-element, low-pass prototype data are given for impedance-matching networks. (Author)

AD-255 515 Div. 8
(11 May 61) OTS price $3.60

Times Wire and Cable Co., Inc., Wallingford, Conn.
DESIGN AND DEVELOPMENT OF A WATERTIGHT LOW LOSS STABLE R. F. CABLE.
Interim development rept. 24 Sep 60-24 Mar 61. 24 Mar 61, 30p. incl. illus. tables.
(Contract NObsr-81424)
Unclassified report

DESCRIPTORS: *Radiofrequency cables, Design, *Electric cables, *Coaxial cables, Tests, Attenuation, Moistureproofing, Broadband, Stability, Test methods.

Attenuation, VSWR, and stability tests were run on RG-217/U cables. Tests were also performed on a special insulated braid version of RG-217/U. Test results on this special sample were inconclusive. Comparative results definitely show that SHIPS-D-3598 cable attenuation is about 12.5% is higher than RG-217/U from 10 to 1000 mc, about 33% lower at 8 kmc, has much better stability when subjected to heat, flexing, or cold bending, and is in general a superior construction for most wide band applications. A study of methods and material for waterproofing was initiated.

AD-255 546 Div. 8
(8 May 61) OTS price $3.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
A CONTRIBUTION TO THE TRANSIENT CHARACTERISTICS OF A FREQUENCY BANDPASS AMPLIFIERS,
by Yoshio Moriwaki. 23 Nov 60, 1v. incl. table
(Research rept. no. PIBMRI-835-60)
(Contract AF 18(600)1505)
(AFOSR-216) Unclassified report

DESCRIPTORS: *Band-pass amplifiers, Amplifiers, *Transients, *Electronic circuits, *Tuned circuits, Circuits, Mathematical analysis, *Pulse amplifiers, Signal to noise ratio, Theory, Frequency modulation.

Formulas which give the output waveforms of multi-circuit amplifiers having an arbitrary number of stages for an input consisting of carrier

frequency modulated by a unit step function are derived. Many numerical results which make clear the transient characteristics of multi-stage amplifiers are presented. (Author)

AD-255 550 Div. 8, 7, 25
(8 May 61) OTS price $2.60

Republic Aviation Corp., Farmingdale, N. Y.
OPTIMIZATION OF EMISSION LIMITED THERMIONIC GENERATORS,
by Alfred Schock. Feb 61, 23p. incl. illus. table. (Rept. no. PPL-TR-61-3A (259))
(Contract Nonr-328500)
Unclassified report

DESCRIPTORS: *Electric power production, Generators, Equations, Cathodes (Electron tubes), Cesium, Space charges, *Thermionic emission, *Diodes, *Cesium electron tubes.

Equations are derived describing the performance of space charge neutralized thermionic converters with negligible transport effects. For a given anode work function and cathode temperature, optimization of the other system parameters leads to an expression for the maximum attainable conversion efficiency, in terms of the fundamental physical constants e, m, c, and k, (e and m, the charge and mass of an electron; k, Boltzmann's constant and c, the velocity of light). The calculated results, presented graphically, suggest several distinct modes of high efficiency operation, and lead to a number of interesting conclusions about converters with cesium coated cathodes. (Author)

AD-255 555 Div. 8
(7 May 61) OTS price $6.60

SFD Labs., Inc., Union, N. J.
RESEARCH ON SUPER POWER MICROWAVE AMPLIFIER,
by H. L. McDowell. Quarterly progress rept. no. 2, 1 Oct 60-1 Jan 61. Jan 61, 62p. incl. illus.
(Contract DA 36-039-sc-85379, Proj. 3A99-13-001-05)
(ARPA Order no. 130-60) Unclassified report

DESCRIPTORS: *Microwave amplifiers, Microwave equipment, Amplifiers, *Electron tubes, *Space charges, *Magnetrons, Theory, Radiofrequency oscillators, Attenuation, Broadband, *Electronic circuits, Coupling circuits, Waveguide couplers, Tests, Cathodes (Electron tubes), Impedance matching, Mathematical analysis, Radiofrequency power.

Studies of the space charge mode were made using the SFD-202 and the SFD-203 smooth bore tube. Large amounts of current were drawn in violation to the magnetron cut-off criterion as a result of this mode. Studies were also made of the lock-out of the space charge mode by an RF signal. At sufficiently high input levels the mode is almost completely locked out. At lower levels it is the factor which limits usable gain. The normalizing parameters for the space charge mode and a theoretical analysis which may explain its mechanism are considered. Some speculations on the significance of the space charge mode in magnetrons are made. Cold tests on the capacitive strapped circuit for the SFD-203 were actively pursued. A fair match to coaxial line and to waveguide was obtained. Results of impedance and dispersion measurements are presented along with a simple theory which accounts for the major characteristics of the circuit. Experiments using the SFD-202 as a tunable oscillator with an external feedback loop were performed. Tuning over a wide frequency range with single knob control was accomplished. Some simple tests were performed to identify a multipactor attenuation effect which has been a source of trouble. (Author)

AD-255 566 Div. 8, 26
(8 May 61) OTS price $1.60

Transistron Electronic Corp., Wakefield, Mass.
INDUSTRIAL PREPAREDNESS STUDY FOR DIFFUSED SEMICONDUCTOR DEVICES,
by J. Sucharzewski. Quarterly rept. 1 Oct-31 Dec 60 on Devices 2, 14, 15, 16, and 20. 31 Dec 60, 15p.
(Contract DA 36-039-sc-72714)
Unclassified report

DESCRIPTORS: *Semiconductors, *Transistors, Silicon, Germanium, *Manufacturing methods, Production, Design, Tests, Life expectancy.

AD-255 572 Div. 8, 16
(12 May 61) OTS price $6.60

Columbia U. Coll. of Physicians and Surgeons, New York.
AUTOMATIC ELECTRONIC RECORDING INTERFEROMETER. III. OPERATING MANUAL AND SOME APPLICATIONS,
by Raymond Jonnard. Final technical rept. Mar 61, 65p. incl. illus. tables.
(Contract Nonr-26662)
Unclassified report

DESCRIPTORS: *Recording devices, Automatic, Interferometers, *Electronic equipment, *Electronic circuits, Circuits, *Electronic recording systems, Optical equipment, *Optical instruments, Photomultipliers, Feedback amplifiers, Power supplies, Proteins, Dehydrogenases, Nucleotides, Fractionation, Serum, Potentiometers, Servo amplifiers, Amplifiers, Servo motors, Instruction manuals, Hydrocarbons, Hemoglobin, Titration, Sulfates, Cerium compounds, Arsenic compounds, Enzymes.

Attempts to develop interferometer applications led to the re-design of the photomultiplier circuit (stabilization), the amplifier (negative feedback), the zero-adjusting and dark current cancellation circuit, and the rotation measuring bridge (now both axtuated from the main power block). A monitoring meter to check the balance of the servo-motor loop by a resonance method was added. The optical system incorporates new improvements (cooled lamp house, automatic scanning of the monochromator, interferometer slit adjustable transversally, longer decollimator tube, and improved liquid cell allowing continuous circulation of both unknown and reference fluids with an optical path increased to 5 mm). A complete modus operandi and trouble-shooting instructions are offered. Finally some applications were explored in a preliminary manner and the results are tabulated (dispersion within an absorption band, comparative dispersion of some hydrocarbon derivatives, non-aqueous titrations, dynamics of proteins denaturation and stability in solution, etc...). (Author)

Division 8-ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-255 665 Div. 8, 25
(10 May 61) OTS price $1.60

Air Force Cambridge Research Labs., Bedford, Mass.
MAGNETIC PHOTOMULTIPLIER WITH LARGE CATHODE FOR EXTREME ULTRAVIOLET,
by L. A. Hall and H. E. Hinteregger. Dec 60, 11p. incl. illus. 14 refs. (Instrumentation for Geophysics and Astrophysics no. 15; AFCRL TR 60-428)
Unclassified report

DESCRIPTORS: *Photomultipliers, Magnetic materials, *Ultraviolet research, *Cathodes, Electron tubes, Magnetic fields, *Ultraviolet radiation, Measurement, Design, Tests, Photoelectrons, Monocromatic light.

The performance of a resistance-strip magnetic multiplier with a cathode of 3.5 inches by 1 inch for extreme ultraviolet radiation measurements is described. The efficiency of transporting the primary electron from the cathode section into the multiplier section of the instrument was investigated as a function of the distance of a narrow stripe of monochromatic illumination from the entrance edge of the dynode strip. The transport efficiency is shown to depend on both the field distortion at the joint of cathode and dynode strip and the recapture of primary photoelectrons by the cathode itself. (Author)

AD-255 666 Div. 8
(9 May 61) OTS price $3.60

Electronic Defense Lab., Mountain View, Calif.
TEM-MODE 3-DB HYBRID DEVICES,
by R. B. Wilds. 1 Sep 59, 30p. incl. illus. table.
(Technical memo. no. EDL-M212)
(Contract DA 36-039-sc-75012)
Unclassified report

DESCRIPTORS: Broadband, *Waveguide couplers, Narrowband, *Power dividers, Electromagnetic waves, *Electronic equipment, Radiofrequency power, Electromagnetic properties, Radar duplexers, *Microwave equipment, Design.

A family of TEM-mode 3-db hybrid devices, operating in the frequency range from 20 mc to 10 kmc, was developed. Various configurations such as split-block coax, stripline, and microstrip were used in practical hybrids. Bandwidth and phase characteristics for seven types of hybrids are described and test results for thirteen different devices are presented. (Author)

AD-255 680 Div. 8
(11 May 61) OTS price $2.60

General Electric Co., Owensboro, Ky.
INVESTIGATION OF EFFECTS OF OPERATING CONDITIONS ON SUBMINIATURE ELECTRON TUBES,
by D. E. Lammers. Quarterly progress rept. no. 11, 1 Jan-1 Apr 61. 1 Apr 61, 21p. incl. illus. tables.
(Contract DA 36-039-sc-78115)
Unclassified report

DESCRIPTORS: *Subminiature electron tubes, *Electron tubes, *Electronic equipment, Life expectancy, *Subminiature electronic equipment, Operation, Electronic circuits, Handbooks, Tests.

Investigation was continued on the effects of a wide variation of operating conditions on subminiature electron tubes. Work was concentrated on the preparation of an approval draft of the handbook, Electron Tube Life Factors, Subminiature Types. A portion of the draft of the handbook is included. (Author)

AD-255 695 Div. 8
(12 May 61) OTS price $9.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
APC WITH PULSE REFERENCE,
by T. J. Rey. 9 Nov 60. 112p. incl. illus. tables, 72 refs. (Rept. no. 47G-0019)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: Automatic, Control, *Frequency stabilizers, Phase detectors, Radiofrequency pulses, Mathematical analysis, Electronic circuits, Frequency dividers, Pulse generators, Radiofrequency oscillators, Functions, Linear systems, Tests.

Research is concerned with single-loop automatic phase control (APC) systems wherein the reference signal is a periodically repeated pulse for locking the frequency of an oscillator at the pulse rate, or at a multiple thereof. The locked system is analyzed as a linear, sampled regulator in both the time and the transform domains; the latter is used also to analyze the system just outside synchronism. The theoretically determined values of the stability limit and the pull-in ratio are verified experimentally over a wide range of the system parameters. Previous systems suffer from either severe FM (mainly at the pulse rate) or from an undully small control range; it is shown here that synchronism over a substantial portion of the tuning range is possible, and that sidebands arising from the control need not exceed -- 100 db. Moreover, the oscillation spectrum is improved with regard to inherent perturbations that are sufficiently small and slow. Evidence for multiplication ratios as great as 300,000 is presented. Performance of this quality is due in part to the design of a balanced clamp circuit for phase detection. (Author)

AD-255 700 Div. 8
(9 May 61) OTS price $2.60.

Melabs., Palo Alto, Calif.
MILLIMETER FERRITE DUPLEXING DEVICES,
by R. A. Henschke. Quarterly progress rept. no. 3, 15 Dec 60-14 Mar 61. 14 Mar 61, 15p. incl. illus.
(Contract DA 36-039-sc-85351, Proj. 3G 19-03-001)
Unclassified report

DESCRIPTORS: *Microwave equipment, Ferrites, Switches, *Transmission lines, Phase shifters, *Waveguide switches, *Radiofrequency attenuators, Design, Tests, *Waveguides, Radar duplexers, Broadband, Attenuation, Magneto-optic rotation, *Electronic switches,

An experimental switch was constructed using tapered transitions instead of quarter-wave transformers in coupling from rectangular guide to the circular guide of the switch at ports 1 and 2. Some improvement in VSWR was noted but improvement was also obtained by a reworking of the quarter wave transformers. Recent improvements in Y-circulator bandwidth led to a reconsideration of the possibility of switching a Y-circulator. Characteristics of a recent Y-circulator are given. Broadbanding of a high power isolator by cascading ferrite sections having different demagnetizing factors was investigated. Some bandwidth improvement was obtained. A prototype low power pulsed attenuator was essentially completed. A four-port high power circulator was constructed using ferrite differential phase shifting elements, a side wall hybrid and a folded magic tree. The experimental unit gave an insertion loss of the order of 1 db with isolations greater than 15 db over the 8% band. (Author)

AD-255 703 Div. 8
(12 May 61) OTS price $5.60

Microwave Lab., Stanford U., Calif.
GENERAL STUDIES IN HIGH-POWER MICROWAVE CONCEPTS,
by M. Chodorow. Scientific rept. no. 27,
1 Oct-31 Dec 60. Feb 61, 37p. incl. illus. (ML rept. no. 791)
(Contract AF 19(604)1930)
(AFCRL-86) Unclassified report

DESCRIPTORS: *Microwave equipment, *Electron tubes, *Electron beams, *Microwave amplifiers, *Electron guns, *Plasma physics, Microwaves, Perturbation theory, Ferrites, Electromagnetic waves, Propagation, Frequency multipliers, Theory, Materials.

Contents:
Microwave tube studies: Investigation of the behavior of velocity-modulated electron beams in long gaps; Electron beam parametric amplifier; Crossed-field electron guns; Electrostatic beam type parametric amplifier
Plasma physics studies: Electron beam interaction with a plasma; Plasma parametric amplifier; High frequency diagnostic techniques for plasmas; Plasma diagnostic techniques; Plasma confinement; Nonlinear plasma theory; Thermal plasmas; Noise in plasmas; Harmonic generation in plasmas; Cesium plasma tube materials and techniques.
Ferrite studies: Ferrite nonlinear resonance; Ferrite frequency multiplication

AD-255 704 Div. 8
(11 May 61) OTS price $2.60

Microwave Lab., Stanford U., Calif.
MICROWAVE RESEARCH.
Quarterly status rept. no. 8, 1 Nov 60-31 Jan 61.
Mar 61, 25p. incl. illus. (M. L. rept. no. 797)
(Contract Nonr-22548)
Unclassified report

DESCRIPTORS: *Space charges, Electromagnetic waves, *Klystrons, Field emission, Theory, Ferroelectric materials, Ferrites, Quantum mechanics, *Microwave equipment, Cyclotrons, *Electron tubes, Propagation, *Microwave amplifiers, Electron beams, Ceramic materials, Frequency multipliers.

Contents:
General studies of space-charge waves
Cyclotron resonance amplifier
Klystron efficiency studies
Field emission harmonic generation
Quantum harmonic generation
Periodic circuit measurements
Ferroelectric devices
Ferrite nonlinear propagation
Ferrite doubler
Magnetoacoustic excitation in yttrium iron garnet
Generation of submillimeter wavelengths

AD-255 743 Div. 8
(10 May 61) OTS price $10.10

Stanford Electronics Labs., Stanford U., Calif.
INVESTIGATIONS OF MAGNETICALLY TUNABLE NARROW BANDPASS NONRECIPROCAL FILTERS USING FERRIMAGNETIC RESONATORS,
by C. N. Patel. 24 Apr 61, 141p. incl. illus. 28 refs. (Technical rept. no. 411-1)
(Contract Nonr-22524, Proj. NR 373 360)
Unclassified report

DESCRIPTORS: *Radiofrequency filters, Theory, *Band-pass filters, *Microwave equipment, Ferromagnetic materials, Yttrium compounds, Iron compounds, Single crystals, Garnets, *Coupling circuits, Narrowband, X band, *Waveguide couplers, Magnetic fields, Electromagnetic fields, Mathematical analysis, *Cavity resonators, *Waveguide filters, Polarization, *Tuned circuits, Design.

The possibility of a narrow-bandwidth, small-insertion-loss microwave filter with nonreciprocal characteristics is studied, and the findings are reported. The discussion is limited to single-resonance transmission-type filters. In order to obtain tunability over a wide band of frequencies, samples of ferrimagnetic materials such as crystals of yttrium iron garnet, are used as high-Q microwave resonators. An analysis is presented of an equivalent circuit for coupling between 2 microwave circuits using a YIG sphere as the coupling element when the RF magnetic fields due to the 2 circuits are circularly or, in general, elliptically polarized. The experimental device consisted of a cross guide coupler, like a Bethe hole coupler, with only one off-axis aperture which contained the YIG sphere. The experimental results on various filters with different off-axis locations of the aperture are reported. The filters are tunable over the entire X-band by changing the dc magnetic field. The experimental results obtained are in good agreement with those predicted from the theory. (Author)

AD-255 747 Div. 8
(11 May 61) OTS price $4.60

Stanford Research Inst., Menlo Park, Calif.
AN ANTENNA ARRAY OF LONGITUDINALLY-SLOTTED DIELECTRIC-LOADED WAVEGUIDES,
by E. D. Sharp and E. M. T. Jones. Mar 61, 42p. incl. illus. (Scientific rept. no. 6)
(Contract AF 19(604)3502)
(AFCRL-150) Unclassified report

DESCRIPTORS: Antennas, *Slot antennas, Broadband, Microwave equipment, Airborne, *Airplane antennas, *Satellite vehicle antennas, *Spaceships, Countermeasures, Dielectrics, *Waveguide slots, Theory, *Antenna radiation patterns, Super high frequency, Phase measurement, Attenuation, Measurement, Mathematical analysis.

The investigation concerned the design of an antenna made up of an array of dielectric-loaded rectangular waveguides with common narrow walls. Longitudinal slots were cut in the center of each broad wall. The preferred form of the antenna utilized a slab of dielectric was placed over all the slots, although it also operated when dielectric was placed within each guide. An approximate theory is discussed and empirical design data are presented from which an experimental model of this antenna was designed. Empirical data are also given for cases in which dielectric was placed inside the waveguides. The radiated H-field from this antenna was parallel to the antenna aperture, and the main beam was directed up from the apperture at an angle equal to the arc cosine of the velocity of light divided by the slotted-waveguide phase velocity. An experimental antenna was constructed using standard 0.900-by-0.400-inch waveguide, and had an aperture 9 inches wide by 20 inches long. At the design frequency of 10 kmc the E-plane and H-plane beamwidths were 5.4 and 8.0 degrees, respectively, and the E-plane and H-plane first-sidelobe levels were -22.0 db and -23 db, respectively. Good radiation patterns were obtained from 8 to 11 kmc. (Author)

AD-255 750 Div. 8, 7
(9 May 61) OTS price $14.00.

Texas Instruments, Inc., Dallas.
DEVELOPMENT OF PRODUCTION PROCESSES AND TECHNIQUES FOR HIGH VOLTAGE SILICON RECTIFIERS,
by Waylon D. Bryan. Final technical engineering rept. 12 Mar 59-13 May 60. Jan 61, 1v. incl. illus.
(Contract AF 33(600)36110)
(AMC TR 61-7-505) Unclassified report

DESCRIPTORS: *Crystal rectifiers, Silicon, *Diodes, Voltage, Tests, Production, Manufacturing methods, Specifications, Diffusion, Phosphorous, Boron, Coatings, Packaging, Semiconductors, Processing, Seals,

High-voltage silicon rectifiers in the 20,000, 30,000 and 60,000 P.I.V. range for use as clipper diodes in ground and airborne electronic applications can be economically fabricated in production quantities. Successful operation of the rectifiers at extremely high voltages was made possible by resolution of the problems associated with avalanche breakdown, junction forming by diffusion, arcing, stacking of basic cells and packaging. Solution to the problem of arcing under evacuated conditions and packaging contributed most to the success of the program. Test samples furnished to a contractor for application in a fire control system were satisfactory under all conditions. (Author)

AD-255 756 Div. 8, 7, 25
(9 May 61) OTS price $11.00.

Hi-Q Div., Aerovox Corp., Olean, N. Y.
TRANSISTOR TEMPERATURE COMPENSATING CAPACITORS,
by Robert A. Youngs. Final rept. 1 Nov 58-28 Feb 61. 28 Feb 61, 1v. incl. illus. tables.
(Contract DA 36-039-sc-78234)
Unclassified report

DESCRIPTORS: *Ceramic capacitors, Thin films, *Dielectrics, Transistors, Ceramic materials, Subminiature electronic equipment, Production, Temperature,

A summary of the over-all project is given with results reported in tables, graphs, and photographs. Final development models of the Cerafil TC capacitors were fabricated and fully tested according to Table IV of military specification MIL-C-20B with applicable exceptions. The contract tolerances on the temperature coefficients were obtained on the NPO, N750 and N1400 capacitors. The tolerances obtained on N150 capacitors were twice that specified and one and one-half times that specified for the N470 capacitors. All of the temperature compensating (TC) tolerances obtained, however, are improvements over the closest now listed in the military specification. The size specifications were met for the single rods and only a .015 in. increase in diameter was required for the bundled rod capacitors. All of the sizes are marked reductions over those of TC capacitors now on the market. Feasibility has been established for the production fabrication of TC Cerafil capacitors. (Author)

AD-255 787 Div. 8
(10 May 61) OTS price $1.10

Science and Tech. Section, Air Information Div.
Washington, D. C.
ANALYSIS OF A NEMAG SYSTEM.
10 Apr 61, 2p. (Trans. from Limitations of NEMAG (Negative-Effective Mass Amplifier and Generator) Possibilities Due to Inherent Instability of Condition with Negative Conductance. Poluprovodnikovyye Pribory i Ikh Primeneniye; Sbornik Statey, Vyp. 6 (Semiconductor Devices and Their Application; Collection of Articles, no. 6). Moskva, Sovetskoye Radio:103-124, 1960)
(AID rept. 61-45) Unclassified report

DESCRIPTORS: Technological intelligence, Broadband, *Radiofrequency amplifiers, *Microwave amplifiers, Amplifiers, USSR, Semiconductors, Mass energy relation, Stability, *Radiofrequency generators, *Communication equipment, *Negative resistance circuits.

Research concerns efforts made to obtain more definite criteria on the feasibility of a negative-effective mass amplifier and generator system. The functioning of the new device is based on the fact that the effective masses of the charge carriers in a semiconductor may become negative under the influence of some additional energy applied from outside and supplying a sufficient amount of kinetic energy to the carriers. It can be achieved most conveniently with the acceleration of the carriers in the electric field. Soviet interest in the development of a NEMAG system is of importance since success in these efforts would mean the design of a practical device superior to present maser systems with regard to capability of operation in a broad band of frequencies with the possibility of being tuned within this band. A NEMAG device would also possess a very low noise figure and would operate at very high frequencies, thus presenting extremely attractive possibilities for application in reliable, long-range space communications systems.

AD-255 800 Div. 8
(12 May 61) OTS price $5.60

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
INVESTIGATION OF NOISE GENERATION IN ELECTRICALLY TUNABLE MICROWAVE OSCILLATORS,
by G. C. Dalman and P. R. McIsaac. Quarterly progress rept. no. 2, 15 Dec 60-15 Mar 61. 15 Mar 61, 53p. incl. illus. table (Research rept. no. EE 493)
(Contract DA 36-039-sc-87368)
Unclassified report

DESCRIPTORS: *Microwave oscillators, Electron tubes, *Communication theory, Test methods, Radiofrequency spectrum analyzers, Noise analyzers, Reduction, Measurement, Electron beams, Mathematical analysis, *Noise (Radio), Microwave networks, *Traveling wave tubes, *Backward-wave oscillators, *Backward-wave amplifiers, Signal-to-noise ratio, *Microwave equipment, Electronic equipment, Oscillators.

Backward-wave-amplifier gain near the start of self-oscillation is computed for the large-C case, and a design of equipment for experimental measurements of noise along an electron beam is presented. The problem of relating the circuit and beam equations for the backward-wave oscillator is discussed, and a method of solution is suggested for the linear case. Assembly of a spectrum analyzer to measure self-spectra and cross spectra was begun and was almost completed. To test the noise reduction method suggested by Dr. C. C. Wang, an experimental layout is proposed that will not need good slow-wave couplers. The necessary modifications for further tests of the experimental traveling-wave tube are dis-

cussed. Some calculations are performed to show the effect of the QC product on the properties of helical slow wave couplers. Network functions are obtained that yield a noisy communication network for which the total error is minimized. (Author)

AD-255 821 Div. 8, 6
(12 May 61) OTS price $7.60

Electronic Communications, Inc., Timonium, Md.
STEERABLE ANTENNA TECHNIQUES FOR AIRBORNE FERRET RECONNAISSANCE,
by R. F. Packard and M. Cohn. Final rept. 31 Mar 61, 73p. incl. illus. tables, 23 refs.
(Contract AF 19(604)5234)
(AFCRL-180) Unclassified report

DESCRIPTORS: *Direction finding, Design, *Bearing finding, *Aerial reconnaissance, *Phase shifters, *Antenna radiation patterns, *Helical antennas, *Slot antennas, *Discone antennas, Antennas, Ferrites, Measurement, Ferroelectric materials, Phase measurement, Waveguides, Airborne, Diodes, Germanium, Satellite vehicles, Broadband, Aircraft.

A direction finder system is described in which the phase of a signal from a spiral phase antenna is measured with respect to the phase of the same signal from a constant phase reference antenna in order to determine bearing. Phase is measured with an electronically controlled ferrite phase shifter. System components which were developed are described. Radiation pattern measurements at 700 mc of the antennas separately and as a system are reported. This direction finder determines bearings unambiguously. Simultaneous omnidirectional and directive azimuth antenna patterns are possible. Study of a coaxial TE11 mode ferrite rotator for possible incorporation in a cavity-backed annular slot spiral phase antenna is reported. As an alternative of ferrite devices, ferroelectric phase shifters are suggested. Large predicted phase shifts were achieved. Ferroelectric phase shifters offer potential advantages over ferrite phase shifters in size, weight, speed, and power requirements. (Author)

AD-255 823 Div. 8, 25
(12 May 61) OTS price $4.60

Florence U. (Italy).
SCATTERING OF EVANESCENT WAVES BY CYLINDRICAL STRUCTURES,
by Laura Ronchi, Vera Russo and others. Oct 60, 44p. incl. illus. (Technical note no. 8)
(Contract AF 61(052)67)
(AFCRL-95) Unclassified report

DESCRIPTORS: *Electromagnetic waves, Italy, *Diffraction, *Attenuation, Scattering, Cylindrical bodies, Diffraction gratings, Mathematical analysis, Electric fields, Magnetic fields, Electromagnetic fields, Intensity.

Research is presented on the diffraction of an electromagnetic evanescent wave by an infinitely conducting half plane and by an infinitely conducting cylinder of circular cross section. General formulas are given for the near and far fields. Scattering patterns are shown in several particular cases. This study is intended as a first step toward finding the best grating structure which makes it possible to abstract the greatest amount of energy, at a prescribed frequency, from a beam of charged particles in uniform straight motion. (Author)

AD-255 825 Div. 8, 4, 14, 25
(12 May 61) OTS price $1.60

Harvey, C. E., Associates, Pullman, Wash.
RESEARCH INVESTIGATIONS OF SEMICONDUCTOR IMPURITIES,
by Charles E. Harvey. Quarterly rept. no. 3, 14 Jan-14 Apr 61. 14 Apr 61, 12p. incl. tables.
(Contract DA 36-039-sc-78267)
Unclassified report

DESCRIPTORS: *Semiconductors, Impurities, Determination, Chemical analysis, Detection, Materials, Spectrographic analysis, Sulfur, Quantitative analysis, Chlorine, Bromine, Selenium, Phosphorus, Iodine.

A general quantitative or semi-quantitative analytical system was developed for non-metallic elements using spectrochemical methods. The method permits the simultaneous determination of chlorine, bromine, iodine, sulfur, selenium and phosphorus in a single operation. Included are spectrum line sensitivities for the above elements, with detectability limits shown for all lines of these elements in the region 3040A - 4830A. This wavelength range was established as the most valuable region obtainable with the spectrograph used and the discharge conditions employed. The investigation utilized a widely used source unit producing a 20,000 volt unidirectional discharge. An extensive investigation was made to determine optimum constants for pressure, inductance and primary voltage. (Author)

AD-255 826 Div. 8, 12
(12 May 61) OTS price $7.60

Ionospharen-Institut Breisach (Germany).
RESEARCH ON AND RECORDING OF RF-SIGNALS FROM SATELLITES,
by Hanns A. Hess and K. Rawer. Technical rept. (Final) 1 Oct 58-30 Sep 60. 31 Dec 60, 1v. incl. illus. tables.
(Contract AF 61(052)165)
(AFCRL-168) Unclassified report

DESCRIPTORS: *Radio signals, Circuits, *Satellite vehicles, *Ionospheric propagation, Measurement, Frequency shift, Propagation, *Radio transmission, Doppler systems, Design, Magneto-optic rotation, *Radio receivers, *Position finding, Radio equipment, Errors, *Radio reception, Ionosphere, Germany, Electromagnetic effects.

A large number of Doppler frequency shift measurements for radio location were made with 20 MHz radio signals from satellites at Breisach, Germany. Special HF receivers of very high sensitivity and high stability in frequency were developed for these measurements. The purpose of the measurements was to study the ionospheric influence on the propagation of the 20 MHz signals, which causes errors at the radio location of satellites. The result is that this influence becomes especially important when the maximum usable frequency of the ionospheric F sub 2-layer is higher than 20 MHz. The ion clouds within the E-region called ''sporadic E'' may also be considered as source of errors at radio location. (Author)

AD-255 832 Div. 8, 25
(12 May 61) OTS price $1.10.

Electronics Research Lab., U. of Calif., Berkeley.
ELECTRON-STREAM KINETIC-POWER SECOND-ORDER TERMS

AS OBTAINED FROM MACCOLL'S MEAN VALUES,
by C. K. Birdsall. 2 Mar 61, 6p. (Series no. 60. Issue no. 348)
(Contract AF 49(638)102)
(AFOSR-482) Unclassified report

DESCRIPTORS: *Traveling wave tubes, Power, Electron wave tubes, *Electronic circuits, Electric currents, Electron guns, Voltage, Electrons, Mathematic analysis,

MacColl (Bell Syst. Tech. J., 39:365, 1960) has given some mean-value results for traveling-wave-tube circuit voltage and current and for stream density and velocity. This note presents (a) some discussion of his results, (b) some extensions which produce second-order velocity and density values, useful in power calculations, and (c) the dilemma of a change in time-averaged density but none in voltage. (Author)

AD-255 838 Div. 8, 6
(15 May 61) OTS price $8.10

Melpar, Inc., Falls Church, Va.
STUDY OF POLARIZATION MODULATION TECHNIQUES,
by Joseph E. Ferris. Final rept. Feb 61, 80p. incl. illus. tables, 14 refs.
(Contract AF 19(604)4988)
(AFCRL-94) Unclassified report

DESCRIPTORS: *Electromagnetic waves, Theory, Mathematical analysis, Traveling wave tubes, Phase shifters, Delay lines, *Radar jamming, Phase modulation, *Polarization, Airborne, *Antennas, *Countermeasures.

Several methods are described for generating a multipolarized wave for ECM jamming purposes. These methods generally involve the excitation of two orthogonally oriented linear antennas with a varying phase and amplitude. Discussions and mathematical analyses of the performances of these systems are presented and some experimental data is included. Curves of theoretical relationships are plotted to illustrate performance characteristics. (Author)

AD-255 840 Div. 8
(15 May 61) OTS price $8.10

Massachusetts Inst. of Tech., Cambridge.
CIRCUIT APPLICATIONS FOR NEGATIVE RESISTANCE SEMICONDUCTOR DEVICES,
by R. C. Ricci. Master's thesis. Apr 60, 38p. illus. 15 refs.
(AFCRC TR 60-155) Unclassified report

DESCRIPTORS: *Semiconductors, *Electronic circuits, *Negative resistance circuits, *Triodes, Transistors, Thyratrons, *Trigger circuits, *Switching circuits, Germanium, Silicon, Design, Tests, *Pulse generators, Mathematical analysis, Circuits, Analysis.

The PNPN triode and the PNPN thyristor are analyzed, and the observed characteristics of these devices examined in the light of this general analysis. The temperature variation of the V-I characteristic and the capacity of the devices as a function of dc bias are investigated. Negative resistance devices are simulated using transistor pairs of opposite polarity types. The negative resistance semiconductor triodes examined are the RCA germanium thyristor, TA 1832, and the GE high power silicon PNPN triode, ZJ39A. Circuits utilizing the properties of the triode and the thyristor are designed, built, analyzed, and evaluated. These circuits include a free-running pulse generator, a triggered pulse generator, a sawtooth generator, a two thyristor flip-flop, and a one thyristor flip-flop. A discussion of monostable, astable, and bistable operation of circuits is also presented. (Author)

AD-255 842 Div. 8, 30
(15 May 61) OTS price $1.10.

Air Force Cambridge Research Labs., Bedford, Mass.
MINIMAL SYNTHESIS OF THE WYE-FORM TWO-OUTPUT SWITCHING NETWORK,
by S. R. Petrick. Jan 61, 5p. (AFCRL-109)
(Proj. 5632)
Unclassified report

DESCRIPTORS: *Switching circuits, Synthesis, Mathematical analysis, Electrical networks, Special functions, Electronic circuits, Computers,

The problem treated is the simultaneous minimization of three Boolean functions X, Y, and Z such that if F1 and F2 are any two given Boolean functions we have F1 = XY and F2 = XZ. In switching-circuit terminology the problem consists of synthesizing a minimal wye (Y) network to realize two arbitrary switching functions. By reducing the given two-output problem to an equivalent single-output problem, the required minimal synthesis procedure is found for the case where each of the functions X, Y, and Z is restricted to be of the product-of-sums form. (Author)

AD-255 857 Div. 8
(12 May 61) OTS price $7.60

Stanford Electronics Labs., Stanford U., Calif.
OPTIMUM DESIGN OF SAMPLED-DATA SYSTEMS WITH RANDOM PARAMETERS,
by T. L. Gunckel, II. 24 Apr 61, 70p. incl. illus. tables, 38 refs. (Technical rept. no. 2102-2)
(Contract Nonr-22524, Proj. NR 373 360)
Unclassified report

DESCRIPTORS: *Control systems, Design, *Linear systems, Mathematical analysis, Synthesis, Feedback, Statistical analysis, Errors, Theory.

Three problem areas associated with the design of linear sampled-data systems are considered. The first arises from having the transition and distribution matrices of the system be random variables, i.e., the random parameter problem; the second from having multiplicative noise at the input to the system, this being a special case of the first problem area; and the third from being unable to measure the state vector of the system exactly. In each of these 3 areas, the preformance of the system is measured by using either a generalized sum-squared-error, a final-value, or a minimum-time criterion. The design procedures are based either upon minimizing the expected value of the performance index or upon minimizing the performance index in the presence of worst-case variations within the system, e.g., minimizing the expected value of the sumsquared-error. In general, the results are in the form of feedback coefficients which relate the value of the optimum input to the value of the state vector of the system. (Author)

AD-255 858 Div. 8
(12 May 61) OTS price $5.60

Technische Hochschule, Munich (Germany).
RESEARCH ON BROADBAND ANTENNA DESIGN,
by Hans Meinke. Final rept. 1960. 1v. incl. illus.
(Contract AF 61(052)41)
Unclassified report

DESCRIPTORS: *Antennas, Germany, Design, *Antenna radiation patterns, Broadband, Measurement, Impedance, Mathematical analysis, Dielectrics, Coaxial cables, Theory, Impedance matching.

Research was concerned with the development of a broad-band omnidirectional antenna with as many frequency independent electrical characteristics as possible. A review of earlier reports is presented. A summary is also presented of all the usable measures that decrease the frequency dependence of the radiation pattern of broad-band radiators. Two technically important antenna shapes are described in detail: (1) a 50 ohm radiator, with good broad-band matching, having a broad-band diffused radiation pattern which resembles that of a short dipole over a large frequency range, and (2) a 60 ohm radiator that has a constant horizontal direction for the main lobe and also a good broad-band matching. A new coordinate system for the 60 ohm spherical radiator was developed which has the advantage over the preciously used system in that the values Fn and Gn remain finite, even at the radiator apex. (Author)

AD-255 861 Div. 8, 5
(12 May 61) OTS price $1.60

Wisconsin U., Madison.
SURFACE WAVE, ANTENNA AND MICROWAVE FILTER ENGINEERING RESEARCH STUDY,
by Elmer H. Scheibe. Quarterly progress rept. no. 6, 1 Dec 60-28 Feb 61. 31 Mar 61, 11p. incl. illus.
(Contract DA 36-039-sc-78326, Proj. 3-99-12-100)
Unclassified report

DESCRIPTORS: *Microwave equipment, Antennas, Propagation, *Communication equipment, Diffraction, *Radiofrequency filters, Reflection, *Cavity resonators, *Parabolic antennas, Measurement, *Waveguides, Design.

Research was continued on a study on surface waves, antennas, and microwave circuits. An additional paraboloid was fabricated and used in a diffraction loss measurement for a low loss beam waveguide. Major effort was devoted to a measurement of the reflection loss at the end plate of a beam waveguide resonator. A right angle resonator, that is, a resonator in which the beam from one end plate is deflected 90 degrees to the second end plate by a central flat plate, was used for the reflection loss study. Two additional responses were found to exist in this resonator but no conclusions regarding them were reached. The study made with the right angle resonator also gave information on the loss of a 90 degrees bend in a beam waveguide. (Author)

AD-255 863 Div. 8
(10 May 61) OTS price $5.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
THE NEAR-FIELD OF LONG ENDFIRE DIPOLE ARRAYS,
by E. K. Damon. Rept. on Antenna Phenomena Research. 20 Sep 60, 48p. incl. illus. 11 refs. (Rept. no. 1035-5)
(Contract DA 36-039-sc-84920, Proj. 3-99-00-000)
Unclassified report

DESCRIPTORS: *Antennas, *Dipole antennas, *Antenna radiation patterns, X band, *Radar antennas, Phase modulation, Phase measurement, Antenna masts, Measurement.

Measured phase and amplitude data on a variety of long (40 wavelength) endfire arrays of dipoles are presented. Correlation with far-field radiation patterns is made and a parallel theoretical program is referred to. Measured local phase velocity agreed well with calculated values, and uniform, tapered, and periodically modulated arrays with the proper average phase shift all had approximately the theoretical expected gain. (Author)

AD-255 922 Div. 8
(15 May 61) OTS price $4.60

Aero Geo Astro Corp., Alexandria, Va.
A STUDY OF FLUSH-MOUNTED AIRBORNE ANTENNAS FOR FERRET AND ECM APPLICATIONS,
by D. M. Bowie and B. R. Gross. Final rept. 23 Mar 61. 39p. incl. illus. 56 refs.
(Contract AF 19(604)5481)
(AFCRL-151) Unclassified report

DESCRIPTORS: *Antennas, Airborne, Countermeasures, Dielectrics, Polarization, Transmission lines, Broadband, Materials, *Airplane antennas, Waveguides, Measurement, Design, Aerial reconnaissance, Theory, Effectiveness, Microwave frequency, *Slot antennas, Antenna radiation patterns.

Work was directed toward several basic problems associated with microwave radiation from apertures in proximity to finite conducting surfaces, with emphasis on techniques applicable to airborne antennas, particularly the use of open wave supporting structures. Results of a detailed investigation of effects of a low-susceptibility dielectric coating for parallel and perpendicular polarization indicated that low-angle signal enhancement for the two polarizations simultaneously could be obtained with the use of an artificially polarized dielectric layer. The effectiveness of two such media, a pin dielectric of very low density and a rodded dielectric, in achieving low-angle enhancement for both principal polarization is demonstrated. The problem of waves guided along a conducting channel loaded with a flush-mounted dielectric layer is treated theoretically using field equations of Helmholz form. Experimental results for vertically and horizontally excited waves are presented. Performance characteristics of a compact, broad-band, low silhouette radiator offering omnidirectional coverage in azimuth for both horizontal and vertical polarization, as well as a survey of materials for use in open wave-supporting media are summarized. (Author)

AD-255 929 Div. 8
(15 May 61) OTS price $8.10

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
ELECTRON TUBE RESEARCH,
by N. DeClaris. Quarterly progress rept. no. 5, 1 Dec 60-28 Feb 61. 28 Feb 61, 1v. incl. illus. tables, 26 refs. (Research rept. no. EE 492; Rept. no. 9)
(Contract DA 36-039-sc-85272)
Unclassified report

DESCRIPTORS: *Electron tubes, Delay lines, *Electronic circuits, Synthesis, Analysis, Impedance, Space charges, *Diodes, Broadband, Radiofrequency amplifiers, Design, *Anodes (Electron tubes), Pulse generators, Admittance, Radiofrequency filters, Triodes, Mathematical analysis, Distributed amplifiers, Measurement, Cathodes (Electron tubes).

An experimental investigation of the input electronic impedance as a function of transit angle and space charge for a diode with movable anode is presented. A set of measurements provides calibration of the diode for shot-noise measurements and also gives the fundamental information on the limitations of the Llewellyn-Peterson equations. A method for optimizing the use of four-terminal-pair vacuum tubes (matchbox) in wide-band amplifiers is outlined. Two theorems are presented stating sufficient conditions for a passive RL driving-point admittance function to be realized by a simple active RC network, and are illustrated by two examples. Recent results for the realization of the link connection as a coded pulse generator and matched filter are outlined. Networks containing only one variable element and one fixed resistor are examined, and necessary and sufficient conditions for the realizability of this type of driving-point impedances are stated. A realization procedure is developed which leads to a canonic form, and it is utilized in the realization of transfer magnitude functions. A review of the frequency-domain approach to time-varying linear system analysis as developed by Zadeh is presented. A technical report describing the use of grounded-cathode triodes in distributed amplifiers is appended. (Author)

AD-255 953 Div. 8, 2, 6
(16 May 61) OTS price $1.60

Naval Research Lab., Washington, D. C.
A NOTE ON SELECTION OF AN ATMOSPHERIC REFRACTIVITY MODEL FOR RADAR RANGE-HEIGHT-ANGLE CHARTS,
by L. V. Blake. 24 Apr 61, 11p. incl. illus. tables, 7 refs. (NRL Rept. no. 5626)
Unclassified report

DESCRIPTORS: *Atmosphere models, *Radar charts, *Atmospheric refraction, Refractive index, Propagation, Atmosphere, *Radar ranges, Theory, *Radio waves, *Radar plotting, Radio transmission, Determination, *Height finding.

Research established the superiority of a negative-exponential model of the atmospheric radio refractivity vs height function, compared to the linearly decreasing refractivity assumed by the well-known 4/3-earth's-radius method, of accounting for ray bending. However, various values of the zero-altitude refractivity and the exponential constant may be used in the exponential model. For many purposes, such as plotting radar coverage on a range-height-chart, a standard assumption for the atmospheric refraction, corresponding to fixed values of these constants, is desirable. Various factors relevant to selection of such a standard are discussed. A chart and table of ray-path range-height values are presented. (Author)

AD-255 970 Div. 8, 7
(15 May 61) OTS price $1.60

Sprague Electric Co., North Adams, Mass.
DEVELOPMENT CONTRACT, HIGH TEMPERATURE PULSE FORMING NETWORK,
by R. Lord, G. Adams, and J. Butner. Quarterly rept. no. 7, 29 Nov 60-29 Feb 61, 29 Feb 61. 17p. incl. illus. (Serial no. 31)
(Contract NObsr-77598)
Unclassified report

DESCRIPTORS: *Electrical networks, Voltage, Electrical corona, Tests, Temperature, Design, *Pulse generators, Gases, Nitrogen, Liquids, Dielectrics, Impregnation, Life expectancy, Pressure, Fluorides, Ethanes, Fluorides, Ethylenes, Polymers.

Research is concerned with full-sized units employing a cushion of various gases above the impregnant (FC-43) in an attempt to design a network not requiring a volume-compensating bellows. Testing was primarily directed at a solution for the problem of maintaining a high corona starting voltage over the entire operating temperature range of the network. Tests reported in the Sixth Quarterly Report (AD-251 138) were continued in conjunction with tests performed on full-sized units employing volume-compensating bellows. Life testing was continued of small networks using FC-43 liquid impregnant. Data obtained from these tests indicated that final design stress will satisfactorily meet required specifications. (Author)

AD-255 977 Div. 8, 5
(15 May 61) OTS price $1.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
HIGH-GAIN ANTENNA REALIZATION AND TRACKING STUDY. Final engineering rept., vol. 1, 22 Jan 60-22 Jan 61. 22 Jan 61, 11p. illus. 6 refs. (Rept. no. 1072-1)
(Contract AF 30(602)2166)
(RADC TR 61-73A) Unclassified report

DESCRIPTORS: Antennas, Signal-to-noise ratio, *Satellite vehicles, *Communication systems, Design, Reflectors, Ultra high frequency, *Radio communication systems, *Communication equipment, Noise (Radio), *Parabolic antennas, Reflection, Radio signals.

Research is concerned with determining the feasibility of constructing a highly steerable antenna having a gain on the order of 70 db at 2000 mc. The antenna is intended to be used in a passive communication system employing spherical reflectors or distributed chaff in orbit. The relative advantages of an array type antenna over a single aperture antenna are discussed. The gain limitations of large array type antennas as well as the sources of noise temperature in an array are considered along with a discussion of methods of correcting for atmospheric effects occuring across the aperture of a large antenna. (Author)

AD-255 986 Div. 8, 17, 25
(16 May 61) OTS price $1.60

Battelle Memorial Inst., Columbus, Ohio.
INDIUM ANTIMONIDE FOR SEMICONDUCTOR-DEVICE FEASIBILITY STUDIES,
by T. S. Shilliday, F. J. Reid and others. Scientific rept. no. 6, 1 Jan-31 Mar 61. 20 Apr 61, 18p. incl. illus. tables.
(Contract AF 33(616)6450)
Unclassified report

DESCRIPTORS: *Semiconductors, Indium alloys, *Indium compounds, *Antimonides, *Intermetallic compounds, *Semiconducting films, Voltage regulators, Electronic equipment, Diodes, Diffusion, Crystals, Single crystals, Growth, Zone melting, Thin films, Electrical properties, Purification, Heat treatment, Design, Transistors, Vapor plating.

In the preparation of high-purity InSb, zone-refining experiments are under way which incorporate the following improvements over previously used procedures: (1) use of monocrystalline rather than polycrystalline ingots for zone refining, (2) use of cropping techniques, and (3) use of heat treatments in conjunction with zone refining to assist in the removal of volatile impurities. Design of the magnetoresistance voltage regulator for use as a tunnel-diode bias source has been completed. InSb-film depositions were made during this period on Vycor and polished, polycrystalline alumina substrates. The improvements in the properties of films deposited at high substrate temperatures which it was thought might occur with the use of alumina were not observed. Also during this period, films deposited from p-type evaporants were p-type on the basis of thermoelectric-probe measurements. In junction-device studies the influence of magnetic fields on the reverse characteristics of InSb-grown p-n junctions was investigated. In tunnel-diode-fabrication studies only faint evidence of tunnelling in the forward direction was observed. Rectification was observed in InSb p-n junctions prepared by out-diffusion. (Author)

AD-255 988 Div. 8, 1, 12, 26, 30
(15 May 61) OTS price $6.60

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
RELIABILITY. A SUBJECT BIBLIOGRAPHY, comp. by Tibor Vincze. Feb 61, 60p. (Technical rept. no. 61-1)

Unclassified report

DESCRIPTORS: *Reliability, *Bibliography, *Electronic equipment, *Guided missiles, *Rockets, Quality control, *Electron tubes, Aircraft, Computers, Mathematical analysis, Military requirements, Statistical analysis, *Communication equipment, *Human engineering, Tests, Economics.

This bibliography contains 514 references and was compiled to provide scientists, teachers, and students with a ready reference to literature on Reliability. Subjects are covered to include military and civilian applications. Among the subjects covered are: (1) economic aspects, (2) mathematical and statistical analysis, (3) study and teaching, (4) human factors, and (5) management. The entries are arranged alphabetically under each subject. Reviewed are periodical articles, technical reports, books, and theses. (Author)

AD-255 990 Div. 8
(16 May 61) OTS price $4.60

Microwave Associates, Inc., Burlington, Mass.
PHASE SHIFTER. STUDY PROGRAM (NON-FERRITE), by Kenneth E. Mortenson and Charles Howell. Quarterly progress rept. no. 3, 1 Jan-31 Mar 61. May 61, 22p. illus.
(Contract NObsr-81470)

Unclassified report

DESCRIPTORS: *Phase shifters, *Semiconductors, Microwave equipment, Electronic scanners, *Diodes, Electronic circuits, Materials.

Two general phase-shifting techniques were investigated, both of which employ semiconductor elements. The first approach is the step or incremental phase-shifting device which provides for discrete changes in phase. The second phase-shifting approach is a continuously variable one which provides for a greater flexibility in phase control. Both the semiconductor material and the circuit problems involved in each of these two approaches were further explored in some detail. Results indicate that both the desired phase-shifting characteristics as well as power-handling capabilities can be reached. (Author)

9. FLUID MECHANICS

AD-254 995 Div. 9, 15, 25
(1 May 61) OTS price $3.60

Royal Inst. of Tech. (Sweden).
THE EFFECT OF THE MOLECULAR MODEL ON SOLUTIONS TO LINEARISED COUETTE FLOW FOR LARGE KNUDSEN NUMBER,
by D. Roger Willis. Dec 60, 29p. (Technical note no. 1)
(Contract AF 61(052)348)
(AFOSR-417) Unclassified report

This paper was presented at the 2nd International Symposium on Rarefied Gas Dynamics, Berkeley, California, August 1960.

DESCRIPTORS: *Gas flow, Integral equations, *Superaerodynamics, *Molecules, Sheets.

Sufficient conditions are derived for the convergence of an iterative method of solving the linearized Boltzmann equation for problems with parallel plate geometry, and molecules with a finite collision cross-section. The conditions are proved to be satisfied for Couette flow with hard sphere molecules. In this case the velocity slope is proportional to 1/Kn (1n Kn), when Kn, the Knudsen number, is large. This proves that the expansion techniques for solving the linearised Boltzmann equation are not correct in this case, and demonstrates the importance of the iterative techniques based on an integral equation formulation of the problem. (Author)

AD-254 996 Div. 9
(1 May 61) OTS price $1.60.

Royal Inst. of Tech. (Sweden).
THEORETICAL INVESTIGATIONS IN LINEAR AND NON-LINEAR PROBLEMS, THE DETERMINATION OF SURFACE INTERACTIONS AND EXAMINATION OF DEVELOPMENT OF SHOCK WAVE IN RAREFIED GAS DYNAMICS,
by D. Roger Willis. Final technical rept. Jan 61, 10p.
(Contract AF 61(052)348)
(AFOSR-418) Unclassified report

DESCRIPTORS: *Gas flow, *Superaerodynamics, Molecules, *Shock waves, Determination, Sheets, Integral equations, Orifices, Nonlinear systems, Linear systems,

The specific problems considered were: the convergence of the integral iteration method of solving the Boltzmann equation using hard sphere molecules; center-point mass flow through an orifice; determining interactions by measuring the number flux of molecules reflected from a moving target and; the development of a shock as an infinite flat plate moves, perpendicular to its plane, into a gas initially at equilibrium. A summary of the principal results and conclusions are given. (Author)

AD-254 997 Div. 9
(1 May 61) OTS price $4.60.

Royal Inst. of Tech. (Sweden).
CENTER-POINT MASS FLOW THROUGH A CIRCULAR ORIFICE USING THE INTEGRAL ITERATION METHOD,
by D. Roger Willis. Dec 60, 44p. incl. illus. tables. (Technical note no. 3).
(Contract AF 61(052)348)
(AFOSR-535) Unclassified report

DESCRIPTORS: *Orifices, Superaerodynamics, *Gas flow, Numerical methods and procedures, Molecules,

The mass flow is calculated from the first iterate and for large Knudsen number (Kn) equals 1 + 0.29/Kn. Numerical calculations showed that this is a reasonable approximation for Kn equal to or greater than 6. The treatment is axisymmetric, and the results show that previous quasi-onedimensional analyses could give non-realistic results. (Author)

AD-254 998 Div. 9
(1 May 61) OTS price $4.60.

Royal Inst. of Tech. (Sweden).
INVESTIGATION OF THE DEVELOPMENT OF A SHOCK WAVE FOR TIME SMALLER THAN THE AVERAGE COLLISION TIME,
by D. Roger Willis. Dec 60, 42p. incl. illus. tables (Technical note no. 4)
(Contract AF 61(052)348)
(AFOSR-536) Unclassified report

DESCRIPTORS: *Shock waves, *Superaerodynamics, Sheets, Integral equations, Molecules, Numerical methods and procedures.

The timewise development of a shock wave, as an infinite flat plate moves perpendicular to it's plane into a gas initially at equilibrium, is studied from the kinetic theory standpoint. The problem is analysed using the integral iteration method. Analytic results are given for the free molecular regime, and preliminary numerical results are given for times less than and equal to the average collision time. Some effects of the numerical techniques are discussed, and suggestions given for improving those that seemed to be inefficient for times larger than the average collision time. (Author)

AD-254 999 Div. 9, 15
(1 May 61) OTS price $4.60.

Royal Inst. of Tech. (Sweden).
ON THE POSSIBILITY OF DETERMINING SURFACE INTERACTIONS BY MEASURING THE NUMBER FLUX OF MOLECULES REFLECTED FROM A MOVING TARGET,
by D. Roger Willis. Dec 60, 43p. incl. illus. table. (Technical note no. 2)
(Contract AF 61(052)348)
(AFOSR-537) Unclassified report

DESCRIPTORS: *Shock waves, Sheets, Integral equations, *Superaerodynamics, *Molecules, Numerical methods and procedures, *Re-entry aerodynamics, Surfaces, Reflection, Statistical functions, Velocity, Molecular beams, Numerical analysis,

It was suggested that information regarding surface interactions could be obtained by measuring the number flux of molecules reflected from a moving target. We consider the possibility of determining f sub 0(v'), the distribution function of velocities of the emitted molecules relative to the target, by this method. An integral equation for f sub 0 is obtained, but it is not of a type that can readily be classified, and it was not possible to prove anything analytically about the existence of solutions to the equation. Trial numerical solutions were made for the case when f sub 0 is a function of the speed v' only. The calculated values of f sub 0 were found to be very sensitive to the details of the numerical technique, and to any scatter in the values of the number flux. A

method of determining the mean speed of the reflected molecules was found. This should not be very sensitive to scatter in the values of the number flux, and could be useful for testing the validity of proposed interactions. (Author)

AD-255 006 Div. 9
(1 May 61) OTS price $3.60

Technische Hochschule, Munich (Germany).
RIEMANN'S PROBLEM FOR A LAVAL NOZZLE. II. TWO-DIMENSIONAL TREATMENT,
by Rudolf Schatz. 20 Dec 60, 26p. illus. tables. (Technical note no. 2)
(Contract AF 61(052)377)
(AFOSR-415) Unclassified report

DESCRIPTORS: *Laval nozzles, *Compressible flow, Pressure, Density, Differential equations, Entropy, Numerical analysis.

Results are given of a two-dimensional treatment of RIEMANN's problem for a LAVAL nozzle. Comparison with results obtained previously (AD-230 223) by hydraulic approximation method shows satisfactory agreement. (Author)

AD-255 059 Div. 9
(2 May 61) OTS price $1.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
INVISCID MODES OF INSTABILITY FOR FLOW IN A CURVED CHANNEL,
by D. A. Lee and W. H. Reid. Apr 61, 14p. incl. illus. tables (Technical rept. no. 40; Nonr 56207/40)
(Contract Nonr-56207)
Unclassified report

DESCRIPTORS: *Gas flow, Mathematical analysis, *Fluid mechanics, Series, Functions.

The inviscid modes of instability are investigated for the flow between concentric circular cylinders due to the combined effects of rotation and of a constant pressure gradient acting round the cylinders. Detailed results are obtained for the case of pure pressure flow in the limit of the small gap approximation. The results obtained show that both convective and oscillatory modes of instability are present. (Author)

AD-255 190 Div. 9, 25
(3 May 61) OTS price $0.50

National Aeronautics and Space Administration, Washington, D. C.
EXPLORATORY INVESTIGATION OF TRANSPIRATION COOLING OF A 40 DEGREE DOUBLE WEDGE USING NITROGEN AND HELIUM AS COOLANTS AT STAGNATION TEMPERATURES FROM 1,295 DEGREES F TO 2,910 DEGREES F,
by Bernard Rashis. May 61, 18p. incl. illus. 10 refs. (Technical note D-721; Supersedes NACA Research Memorandum L57F11, AD-138 635)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-721.

DESCRIPTORS: *Sweat cooling, Wedges, Nitrogen, Helium, Coolants, Model tests, High temperature research, Stainless steel, *Aerodynamic heating.

An investigation of transpiration cooling was conducted in the preflight jet of the Langley Pilotless Aircraft Research Station at Wallops Island, Va. The model consisted of a double wedge of 40 degrees included angle having a porous stainless-steel specimen inserted flush with the top surface of the wedge. The tests were conducted at a free-stream Mach number of 2.0 for stagnation temperatures ranging from 1,295 F to 2,910 F. Nitrogen and helium were used as coolants and tests were conducted for values ranging from approximately 0.03 to 0.30 percent of the local weight flow rate. The data for both the nitrogen and helium coolants indicated greater cooling effectiveness than that predicted by theory and were in good agreement with the results for an 8 degree cone tested at a stagnation temperature of 600 F. The results indicate that the helium coolant, for the same amount of heat-transfer reduction, requires only about one-fourth to one-fifth the coolant flow weight as the nitrogen coolant. (Author)

AD-255 191 Div. 9, 12
(3 May 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL EVALUATION OF THE DECELERATION OF ALUMINUM CYLINDERS ROTATING IN A MAGNETIC FIELD AND COMMENTS ON MAGNETIC DAMPING OF A FLYWHEEL CONTROL,
by Donald G. Eide. Apr 61, 35p. incl. illus. 11 refs. (Technical note D-749)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-749.

DESCRIPTORS: *Deceleration, Aluminum, *Satellite vehicles, *Bodies of revolution, Cylindrical bodies, Magnetic fields, Control, Damping, Flywheels, Rotation, Torque, Test equipment, Test methods, Stabilization, Control systems, Tests, Spin.

An experimental investigation was made to determine the magnetic deceleration of a closed-end cylinder rotating in a magnetic field by use of opposed ball and socket air bearing support. The theories of Smythe and Hooper were compared with the experimental data for aluminum cylinders with fineness ratios of 9:1, 4:1, and 2:1 and a wall thickness of 0.254 centimeter and one cylinder with a fineness ratio of 6:1 and a wall thickness of 0.508 centimeters. A method is outlined by which the magnetic damping coefficient for the spinning motion of a body of revolution may be determined experimentally. The theory of Smythe for a thin-walled cylinder predicts values greater than experimental results for fineness ratios of less than 6:1. Hooper's theory is in agreement with the experimental results throughout the range of fineness ratios tested. A utilization of the magnetic damping to prevent overspeeding of a flywheel used in a satellite orientation system is discussed. (Author)

AD-255 193 Div. 9
(3 May 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
SOME SIMPLE SOLUTIONS TO THE PROBLEM OF PREDICTING BOUNDARY-LAYER SELF-INDUCED PRESSURES,
by Mitchel H. Bertram and Thomas A. Blackstock. Apr 61, 50p. incl. illus. 30 refs. (Technical note D-798)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-798.

Division 9-FLUID MECHANICS

DESCRIPTORS: *Hypersonics, Sheets, *Boundary layer, Pressure, Mathematical analysis, Viscosity, Theory, *Hypersonic flow, Mathematical prediction, *Blunt bodies.

Simplified theoretical approaches are shown, based on hypersonic similarity boundary-layer theory, which allow reasonably accurate estimates to be made of the surface pressures on plates on which viscous effects are important. The consideration of viscous effects includes the cases where curved surfaces, stream pressure gradients, and leading-edge bluntness are important factors. (Author)

AD-255 194 Div. 9
(3 May 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
A METHOD OF DETERMINING AERODYNAMIC-INFLUENCE COEFFICIENTS FROM WIND-TUNNEL DATA FOR WINGS AT SUPERSONIC SPEEDS,
by Patrick A. Gainer. Apr 61, 34p. incl. illus. tables (Technical note D-801)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-801.

DESCRIPTORS: Mathematical analysis, Pressure, Experimental data, *Load distribution, *Triangular wings, Wind tunnels, Theory, *Supersonics, *Wings, Errors, *Aerodynamics.

A method is described for determining aerodynamic-influence coefficients from wind-tunnel data for calculating the steady-state load distribution on a wing with arbitrary angle-of-attack distribution at supersonic speeds. The method combines linearized theory with empirical adjustments in order to give accurate results over a wide range of angles of attack. The experimental data required are pressure distributions measured on a flat wing of the desired planform at the desired Mach number and over the desired range of angles of attack. The method was tested by applying it to wind-tunnel data measured at Mach numbers of 1.61 and 2.01 on wings of the same planform but of different surface shapes. Influence coefficients adjusted to fit the flat wing gave good predictions of the spanwise and chordwise distributions of loadings measured on twisted and cambered wings. (Author)

AD-255 195 Div. 9
(3 May 61) OTS price $0.75

National Aeronautics and Space Administration, Washington, D. C.
INVESTIGATION AT HIGH SUBSONIC SPEEDS OF THE USE OF LOW AUXILIARY TAIL SURFACES HAVING DIHEDRAL TO IMPROVE THE LONGITUDINAL AND DIRECTIONAL STABILITY OF A T-TAIL MODEL AT HIGH LIFT,
by William C. Sleeman, Jr. Apr 61, 23p. incl. illus. (Technical note D-804; Supersedes NACA Research Memorandum L57I24, AD-148 466)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-804.

DESCRIPTORS: *Subsonic flow, Tails, *Stability (Longitudinal), Model tests, Lift, Aerodynamic configurations, Airfoils, Aspect ratio, *Stabilizers (Horizontal tail surface), Stability, Stability (Lateral), Wind tunnel models, Swept wings.

An investigation of the use of low auxiliary horizontal-tail surfaces to alleviate the pitch-up tendency at high lift of an airplane configuration having a T-tail was conducted in the Langley high-speed 7- by 10-foot tunnel. The basic model had a wing with an aspect ratio of 3, a taper ratio of 0.143, and an unswept 80-percent chord line. The Mach number for most of the tests extended from 0.60 to 0.94 and the angle-of-attack range was from -2 degrees to approximately 24 degrees at the lowest test Mach number. A preliminary study of a systematic series of auxiliary tails indicated that the pitch-up tendency at high lift encountered on the basic model could be greatly alleviated by use of a relatively small, very low-aspect-ratio auxiliary horizontal tail. This tail was located radially with respect to the fuselage center line with 30 degrees negative dihedral and therefore provided a significant favorable increment to directional stability of the model throughout most of the test angle-of-attack range. (Author)

AD-255 196 Div. 9, 1
(3 May 61) OTS price $3.00

National Aeronautics and Space Administration, Washington, D. C.
TABLES AND CHARTS OF THE NORMAL COMPONENT OF INDUCED VELOCITY IN THE LATERAL PLANE OF A ROTOR WITH HARMONIC AZIMUTHWISE VORTICITY DISTRIBUTION,
by Harry H. Heyson. Apr 61, 200p. incl. illus. tables (Technical note D-809)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-809.

DESCRIPTORS: *Helicopter rotors, Vortices, *Rotor blades, Tables, Velocity, Wake.

The time-averaged induced velocities in the lateral plane of a rotor are computed for wake vorticities which vary as harmonics of the azimuth angle. The first six harmonics are treated for two wake skew angles. The calculated results are presented in the form of contour charts and tables. A brief discussion of the computing program, which featured automatic preparation of the contour charts, is also included. (Author)

AD-255 199 Div. 9, 1
(3 May 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL STUDIES OF FLUTTER OF BUCKLED RECTANGULAR PANELS AT MACH NUMBERS FROM 1.2 TO 3.0 INCLUDING EFFECTS OF PRESSURE DIFFERENTIAL AND OF PANEL WIDTH-LENGTH RATIO,
by Maurice A. Sylvester. May 61, 37p. incl. illus. tables. (Technical note D-833; Supersedes NACA Research Memorandum L55I30, AD-81 258)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-833.

DESCRIPTORS: *Flutter, Supersonic wind tunnels, Model tests, *Airplane panels, Theory, Pressure, Stresses, Vibration, *Aerodynamics, Aerodynamic configurations, *Wings, Deformation.

An estimated flutter boundary is presented for buckled panels clamped on four edges, with width-length ratios of 0.21 to 4.0. Increasing the pressure differential was effective in eliminating flutter on most of the panels tested.

Panels clamped on four edges and buckled in two half-waves in the direction of flow were found to be particularly susceptible to flutter. The results of limited tests on panels with applied damping, curvature, and lengthwise stiffeners are also presented and discussed. (Author)

AD-255 201 Div. 9, 12
(3 May 61) OTS price $0.75

National Aeronautics and Space Administration, Washington, D. C.
FREE-FLIGHT AERODYNAMIC-HEATING DATA TO MACH NUMBER 10.4 FOR A MODIFIED VON KARMAN NOSE SHAPE,
by William M. Bland, Jr., and Katherine A. Collie. May 61, 28p. incl. illus. 16 refs. (Technical note D-889; Supersedes NACA Research Memorandum L56D25, AD-100 135)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-889.

DESCRIPTORS: Model tests, Flight testing, *Aerodynamic heating, *Heat transfer, Atmosphere entry, *Re-entry aerodynamics, Aerodynamics, *Hypersonics, Mathematical analysis, *Aerodynamic configurations, *Guided missile noses, Re-entry vehicles, Hypervelocity vehicles, Bodies of revolution, *Rocket models, Cylindrical bodies, Surface temperatures.

Aerodynamic-heating data were obtained on a modified fineness-ratio-5.0 Von Karman nose shape at free-stream Mach numbers up to 10.4 with a rocket-propelled model. Transient skin temperatures were measured at a station 26.6 in. behind the tip of a nose 31.6 in. long. A maximum skin temperature of 1,663 R was measured. Experimental Stanton numbers agreed with values obtained by Van Driest's turbulent theory until the local Reynolds number had decreased to 6.8 x 10 to the 6th power at a local Mach number of 9.0 and with Van Driest's laminar theory when the local Reynolds number decreased below 3.5 x 10 to the 6th power at Mach numbers less than 8.9. (Author)

AD-255 254 Div. 9, 1, 30
(4 May 61) OTS price $8.10

Engineering Test Div., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
TRANSONIC AND SUPERSONIC WIND TUNNEL TESTS ON 5-PERCENT AND 20-PERCENT SCALE MODELS OF THE WADD INDIVIDUAL ESCAPE CAPSULE,
by Richard T. Smith. Rept. on Investigation of Escape Capsule Systems for Multiplace Aircraft. Dec 60, 70p. incl. illus.
(Proj. no. 1362)
(WADD TN 60-79)
Unclassified report

DESCRIPTORS: *Bailout, Wind tunnel models, *Stability, Stabilization, Spheres, Fins, Booms, Transonics, Supersonics, Bombers, Jet bombers, Jet planes, Aircraft equipment.

The WADD Individual Escape Capsule is an enclosed capsule ejected from a bomber-type aircraft for individual aircrew escape at supersonic Mach numbers. The purpose of the test was to determine the static stability and separation characteristics of the capsule with and without various stabilizing devices. Static aerodynamic stability data were obtained from models in proximity to a typical bomber aircraft fuselage and a model rocket sled. Five configurations were tested: the basic capsule, capsule and fins, capsule and twin trailing booms, capsule and twin booms with a small (10-inch full scale) drag sphere attached to each, and capsule and twin booms with a large (14-inch full scale) drag sphere attached to each. The data presented indicate the capsule with fins and the capsule-boom-large sphere combination give satisfactory stability at Mach numbers from 0.50 to 3.00. (Author)

AD-255 359 Div. 9
(4 May 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ON THE STABILITY OF THE ROTATING MOVEMENTS OF A SOLID BODY THE CAVITY OF WHICH IS FILLED WITH AN IDEAL LIQUID (OB Ustoychivosti Vrashchatel'Nykh Dvizhenii Tverdogo Tela, Polost' Kotorogo Napolnena Idеal'Noy Zhidkost'Yu)
by N. G. Chetayev. Dec 60, 17p. incl. illus. (Trans no. MCL-89 from Prikladnaya Matematika i Mekhanika 21:157-168, 1957)
Unclassified report

DESCRIPTORS: *Stability, Solids, *Rotation, Rotating structures, Liquids, Differential equations, *Fluid flow, Guided missiles, Flight paths, Motion, Fluid mechanics, Guided missile trajectories.

The problem of the accuracy of the flight of a liquid-filled missile along its trajectory is a hard one if the liquid is viscous. If the liquid in the missile is considered as ideal and incompressible, then the correct solutions of the problems can be found in the stability of rotating movements of this solid body, provided that the interior is completely filled with liquid without any bubbles. This solution does not seem unimportant, since starting from it the surplus of stability against the negative influences of viscosity can be considered as sufficient. (Author)

AD-255 468 Div. 9
(8 May 61) OTS price $2.60

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
THE THEORY OF PULSATING FLOW IN CONICAL NOZZLES,
by Harold G. Elrod, Jr. Interim rept. Feb 61, 20p. incl. illus. (Rept. no. I-A2049-15)
(Contract Nonr-234200, Proj. NR 061-113)
Unclassified report

DESCRIPTORS: *Conical nozzles, Nozzles, *Fluid flow, Theory, Differential equations, Compressible flow, Orifices, Pressure, Velocity, Liquids, Fluids, Vapors, Gases, Gas flow, Mathematical analysis, Oscillation.

The present analysis applies to any fluid, liquid or gas, flowing into a simple conical nozzle. The amplitude and phase of the mass-flux response to a sinusoidally time-variable pressure fluctuation at the nozzle exit are determined. An approximate formula is given for these quantities in terms of the nozzle throat area, the solid angle subtended by the cone, the velocity of the fluid at the nozzle throat, the acoustic velocity at the throat, and the frequency of the pressure fluctuation. (Author)

Division 9 - FLUID MECHANICS

AD-255 485 Div. 9
(8 May 61) OTS price $8.60

Heat Transfer Lab., U. of Minn., Minneapolis.
HEAT TRANSFER, TEMPERATURE RECOVERY, AND SKIN FRICTION ON A FLAT PLATE SURFACE WITH HYDROGEN RELEASE INTO A LAMINAR BOUNDARY LAYER,
by E. R. G. Eckert, A. A. Hayday, and W. J. Minkowycz. Feb 61, 88p. incl. illus. 17 refs.
(HTL Technical rept. no. 27)
(Contract AF 49(638)558)
(AFOSR TN 60-1417) Unclassified report

DESCRIPTORS: *Laminar boundary layer, Mathematical analysis, Partial differential equations, Integral equations, *Gas flow, Numerical analysis, Transformations (Mathematics), Heat transfer, Re-entry vehicles, Aerodynamic heating, Film cooling, Friction, Hydrogen, Temperature, Digital computers.

An analysis is presented for a two-component laminar boundary layer on a surface with zero pressure gradient and with mass release. The system of partial differential equations describing the velocity, temperature, and concentration field is converted by a similarity transformation into a system of integral equations. Numerical solutions are obtained on electronic digital computers for air flow with hydrogen injection, for Mach numbers 0 to 12, for free-stream temperatures 123 to 2000 R, and for wall-to-free-stream temperature ratios from 1/2 to 6. Solutions for the condition of zero temperature gradient in the boundary layer at and normal to the wall surface lead to temperature recovery factors. The results are utilized to investigate the validity and accuracy of engineering correlations. The proposed correlations describe the reduction in heat flux into the wall surface and in skin friction reasonably well. No simple correlations have been found for the dependence of hydrogen mass fraction at the surface on the mass release rate and for the temperature recovery factor. (Author)

AD-255 519 Div. 9
(7 May 61) OTS price $7.60

James Forrestal Research Center, Princeton U., N. J.
HYPERSONIC FLOW OVER CONES,
by Stanley A. Berger. Sep 60, 60p. illus.
(Rept. no. 523)
(Contract AF 49(638)465; Proj. 9781)
(AFOSR TN 60-1214) Unclassified report

DESCRIPTORS: *Conical bodies, *Hypersonic flow, Shock waves, Mach number, Taylor's series, Density.

The Taylor-Maccoll equation for the supersonic flow of an ideal gas about a right circular cone with an attached shock wave is solved for the two cases of infinite free stream Mach numbers. The solution for the former is given in terms of an expansion in the limiting density ratio across the shock E(sub)L, and the solution to the latter in terms of a double expansion in the actual density ratio, E, and E(sub)L. The results are compared with a Taylor series solution to the Taylor-Maccoll equation and also with the exact values of Kopal for air and Mueller for helium. (Author)

AD-255 524 Div. 9, 10, 25
(10 May 61) OTS price $1.75.

National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL HEAT TRANSFER AND PRESSURE DROP OF LIQUID HYDROGEN FLOWING THROUGH A HEATED TUBE,
by R. C. Hendricks, R. W. Graham, and others. May 61, 62p. incl. illus. tables, 18 refs.
(Technical note D-765)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-765.

DESCRIPTORS: *Hydrogen, Liquefied gases, *Heat transfer, *Pressure, Fluid mechanics, *Fluid flow, Venturi tubes, Orifices, Flowmeters, Liquid rocket propellants, Boiling, Coolants, Rocket fuels,

The heat-transfer and pressure-drop characteristics of liquid para-H flowing through a heated vertical tube were investigated over the following range of conditions: inlet pressure, 30 to 70 psi; average heat flux, 1 Btu per sq in./sec maximum; and temperature differential 50 to 750 R between the fluid and the wall. As stored in the Dewar, the hydrogen was approximately 95% para. Local pressure drop and heat-transfer coefficients for boiling H are presented. The wall temperature profile along the tube was radically different from that observed in convective heat transfer with single-phase fluids. For the larger heat fluxes, a minimum wall temperature occurred somewhere near the end of the tube, and the maximum temperature occurred near the entrance. A vapor binding or dry-wall condition was apparent in some of the H runs. An empirical correlation for predicting the two-phase heat-transfer coefficient is presented. Pressure-drop measurements showed that the frictional loss is small compared with the momentum loss. In fact, a one-dimensional momentum analysis can predict the pressure drop quite accurately. (Author)

AD-255 527 Div. 9
(8 May 61) OTS price $0.50

National Aeronautics and Space Administration, Washington, D. C.
A SEMIGRAPHICAL METHOD OF APPLYING IMPACT THEORY TO AN ARBITRARY BODY TO OBTAIN THE HYPERSONIC AERODYNAMIC CHARACTERISTICS AT ANGLE OF ATTACK AND SIDESLIP,
by Charlie W. Jackson, Jr. May 61. 18p. incl. illus. (Technical note D-795)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-795.

DESCRIPTORS: *Bodies of revolution, *Hypersonic flow, *Hypersonics, *Aerodynamic configurations, Pressure, Moments, Conical bodies, Blunt bodies, *Re-entry aerodynamics, *Aerodynamics, Mathematical analysis.

A simple semigraphical method of applying impact theory to obtain the aerodynamic characteristics of an arbitrary body at combined angle of attack and sideslip is presented. The necessary equations are derived, a general procedure for application is outlined, and the effects of graphical errors and areas of application are discussed. One of the features of the present method is the requirement of only one graphical construction for any combination of angle of attack and sideslip. As an example application the present method is applied to a blunted

elliptical cone in order to obtain the longitudinal aerodynamic characteristics at an angle of attack of 40 degrees and an angle of sideslip of 0 degrees. (Author)

AD-255 529 Div. 9, 1
(8 May 61) OTS price $6.60

National Aeronautics and Space Administration, Washington, D. C.
METHOD FOR CALCULATING INDUCED VELOCITIES AT THE BLADES OF A SLIGHTLY INCLINED PROPELLER WITH CONSTANT CIRCULATION,
by Harry H. Heyson. May 61. 59p. incl. illus. tables, 11 refs. (Technical note D-818)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-818.

DESCRIPTORS: *Gas flow, *Velocity, Mathematical analysis, Determination, *Propeller blades, Wake, Axially symmetric flow, Numerical analysis, Integration, Vortices, *Aerial propellers.

A method for calculating the induced velocities at the blades of an inclined propeller is presented. The calculations are based upon an assumed wake consisting of one skewed helical vortex per blade. The blade circulation is assumed constant with respect to both radial and azimuth positions. The restriction of uniform radial circulation can be removed by superposition; however, the assumption of constant azimuth-wise circulation restricts the analysis to small propeller inclinations. Numerical values have been obtained for one wake skew angle. These values indicate large effects due to wake vortex spacing and to the number of blades. (Author)

AD-255 530 Div. 9, 25
(8 May 61) OTS price $3.60

National Aeronautics and Space Administration, Washington, D. C.
REGIME OF FROZEN BOUNDARY LAYERS IN STAGNATION REGION OF BLUNT REENTRY BODIES,
by Norman T. Grier and Norman Sands. May 61. 37p. incl. illus. table. (Technical note D-865)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-865.

DESCRIPTORS: Hypersonic flow, *Superaerodynamics, Atmosphere entry, *Re-entry vehicles, Fluid mechanics, Recombination reactions, Blunt bodies, *Boundary layer.

The ratio of Damkohler number (average time a particle remains in the boundary layer to time required for atoms to recombine) to recombination rate constant was calculated assuming thermodynamic equilibrium exists outside the boundary layer. The results are presented for four altitudes between 150,000 and 300,000 ft, nose radii ranging from 1/2 to 10 ft, wall temperatures from 300 to 2000 K, free-stream velocities ranging from 12,000 to 26,000 fps, and values of the wall catalytic reaction rate constant of 0 and 300 cm/sec. Assuming a recombination rate constant of 10 to the 16th power cm to the 6th power squared (sec) and that frozen flow exists when the Damkohler number is less than 10 to the -2nd power, frozen flow exists for a nose radius of 1 ft and a wall temperature of 1000 K above altitudes of 200,000 ft and 260,000 ft for velocities of 12,000 and 26,000 fps, respectively. The ratio of the heat transferred to a noncatalytic wall surface to the heat transferred to a perfect catalytic wall surface with a wall temperature of 1000 K at an altitude of 246,060 ft was approximately 0.5 and 0.22 for velocities of 12,000 and 26,000 fps, respectively. (Author)

AD-255 532 Div. 9
(8 May 61) OTS price $3.60

National Aeronautics and Space Administration, Washington, D. C.
INVESTIGATION OF LOW-SUBSONIC FLIGHT CHARACTERISTICS OF A MODEL OF A HYPERSONIC BOOST-GLIDE CONFIGURATION HAVING A 78 DEGREE DELTA WING,
by John W. Paulson and Robert E. Shanks. May 61, 31p. incl. illus. (Technical note D-894; Supersedes NASA TM X-201, AD-221 637)
Unclassified report

Also available from NASA, Washington, D. C., as NASA Technical note D-894.

DESCRIPTORS: Aircraft, *Triangular wings, Swept-back wings, *Hypervelocity vehicles, *Subsonic flow, Tests, Wind tunnels, Aerodynamics, Stability, Control.

A model was flown over an angle-of-attack range from 10 to 35 degrees. Longitudinal stability and control characteristics were generally satisfactory with neutral or positive static longitudinal stability. The addition of artificial pitch damping resulted in satisfactory longitudinal characteristics with large amounts of static instability. The most rearward center-of-gravity position for which sustained flights could be made either with or without pitch damper corresponded to the calculated maneuver point. The lateral stability and control characteristics were satisfactory up to about 15 degree angle of attack. The damping of the Dutch roll oscillation decreassd with increasing angle of attack; the oscillation was about neutrally stable at 20 degree angle of attack and unstable at angles of attack of about 25 degrees and above. Artificial damping in roll greatly improved the lateral characteristics and resulted in flights being made up to 35 degree angle of attack. (Author)

AD-255 672 Div. 9
(10 May 61) OTS price $1.10

Friedman, Morris D., West Newton, Mass.
ON SHOCKWAVE STRUCTURE IN THE NONRELATIVISTIC CASE,
by S. S. Moiseev. Feb 61, 8p. (Trans. no. M-142 from Izvestiia VUZ, Fizika, 3:158-164, 1960)
(Contract AF 19(604)5969)
(AFCRL-36) Unclassified report

DESCRIPTORS: *Shock waves, Mathematical analysis, Gas flow, Compressible flow, USSR, Relativity theory, Technological intelligence.

The shockwave structure is investigated by using the relativistic kinetic equation. The form of the distribution function within the shockwave is found and the shockwave thickness is also estimated in order of magnitude for the case of a jump from the nonrelativistic to the relativistic state. (Author)

Division 9 - FLUID MECHANICS

AD-255 688 Div. 9
(10 May 61) OTS price $2.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
PRODUCTION OF SECONDARY VORTICES IN THE FIELD OF A PRIMARY VORTEX,
by John R. Weski and Tom M. Rankin. Apr 61, 24p. incl. illus. (Technical note no. BN-244) (Grant no. AFOSR 61-3) (AFOSR-623) Unclassified report

DESCRIPTORS: *Hydrodynamics, Turbulence, Mathematical analysis, Turbulent boundary layer, Laminar boundary layer, *Vortices, Boundary layer, Tests.

Conjectures based upon observations of the decay of larger vortices in shear flow, such as occur e.g. during transition in boundary layers were confirmed when a range of secondary vortices were produced by imposing divergence upon the vortex tube in two controlled experiments for steady and nonsteady flow, respectively. Secondary vortex patterns were analyzed theoretically and experimentally. These flow patterns are seen to represent a possible mechanism for the transfer of energy from primary vortices to motions of higher wave number. (Author)

AD-255 710 Div. 9
(10 May 61) OTS price $0.75

National Aeronautics and Space Administration, Washington, D. C.
HOVERING AND TRANSITION FLIGHT TESTS OF A 1/5-SCALE MODEL OF A JET-POWERED VERTICAL-ATTITUDE VTOL RESEARCH AIRPLANE,
by Charles C. Smith, Jr. May 61, 30p. incl. illus. (Technical note D-404, Supersedes NASA Memo. 10-27-58L, AD-235 121) Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical Note D-404.

DESCRIPTORS: *Jet planes, *Vertical take-off planes, Research planes, Model tests, Flight testing, Stability, Control, Take-off, Airplane landings, Moments, Stability (Lateral), *Aerodynamics, Aerodynamic configurations, Wind tunnel models, Stabilization, Stability (Longitudinal).

This vertical-attitude airplane, which is powered by a single turbojet engine, has a triangular wing mounted high on the fuselage with a triangular tail on top of the wing and has no horizontal tail. The airplane has conventional elevon and rudder controls for use in normal flight and has jet-reaction controls for use in hovering and at low airspeeds. The investigation included stability and control flight tests of the basic model configuration and also included a study of the effects of engine gyroscopic moments on stability and control. (Author)

AD-255 711 Div. 9
(10 May 61) OTS price $2.25

National Aeronautics and Space Administration, Washington, D. C.
INVESTIGATION AT TRANSONIC SPEEDS OF THE LOADING OVER A 45 DEGREE SWEPTBACK WING HAVING AN ASPECT RATIO OF 3, A TAPER RATIO OF 0.2, AND NACA 65A004 AIRFOIL SECTIONS,
by Jack F. Runckel and Edwin E. Lee, Jr. May 61, 93p. incl. illus. tables, 14 refs. (Technical note D-712, Supersedes NACA Research Memorandum L56F12, AD-109 101) Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-712.

DESCRIPTORS: Wings, *Swept-back wings, *Transonics, Aerodynamics, Model tests, Aerodynamic configurations, Reynolds number, Pressure, Load distribution, *Swept wings, Moments, Stability, Airfoils, Aspect ratio.

An investigation at transonic speeds of the loading over a 45 degree sweptback wing having an aspect ratio of 3, a taper ratio of 0.2, and NACA 65A004 airfoil sections was conducted in the Langley 16-foot transonic tunnel. Pressure measurements on the wing-body combination were obtained at angles of attack from 0 degrees to 26 degrees at Mach numbers from 0.80 to 0.98 and at angles of attack from 0 degrees to about 12 degrees at Mach numbers from 1.00 to 1.05. Reynolds number, based on the wing mean aerodynamic chord, varied from 7 times 10 to the 6th power to 8.5 times 10 to the 6th power over the test Mach number range. Results of the investigation indicate that a highly swept shock originates at the juncture of the wing leading edge and the body at moderate angles of attack and has a large influence on the loading over the inboard wing sections. (Author)

AD-255 713 Div. 9, 22, 25
(11 May 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
HEAT-TRANSFER TESTS OF 20-MILLIMETER PROJECTILES AT A MACH NUMBER OF 5 WITH AN ANALYSIS BY UNSTEADY SCALING LAWS TO PREDICT COMPONENT TEMPERATURE RISES AFTER FIRING FOR VARIOUS FREE-FLIGHT CONDITIONS,
by Robert L. Trimpi, James C. Gallagher, and Robert A. Jones. May 61, 30p. incl. illus. (Technical note D-758) Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-758.

DESCRIPTORS: *Projectiles, *Heat transfer, *Aerodynamic heating, Aircraft ammunition, Aerodynamic configurations, Jet fighters, Mathematical analysis, Tests, Test methods, Temperature, Test facilities, Hypersonics, Hypervelocity projectiles.

The temperature time history of various components of a 20-millimeter projectile was obtained by transient heating tests in a Mach number 5 blowdown tunnel. An unsteady scaling law is derived and used to predict the temperature time histories after firing in flight at various Mach numbers and altitudes. (Author)

AD-255 715 Div. 9, 12, 17, 25
(10 May 61) OTS price $0.50

National Aeronautics and Space Administration, Washington, D. C.
THE BEHAVIOR OF BERYLLIUM AND BERYLLIUM COPPER

IN A 4,000 F SUPERSONIC AIR JET AT A MACH NUMBER OF 2,
by William H. Kinard. May 61, 8p. incl. illus. table (Technical note D-806, Supersedes NACA Research Memorandum L57G31, AD-144 849)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-806.

DESCRIPTORS: *Beryllium, *Beryllium alloys, Copper alloys, Physical properties, Jets, *Aerodynamic heating, Simulation, Ablation, Supersonic flow, High temperature research, Model tests, *Guided missile noses, Conical bodies, Specific heat.

A preliminary investigation was conducted in a 4,000 F supersonic air jet at a Mach number of 2 at the Langley Aeronautical Laboratory to investigate the behavior of Be and BeCu. Both materials were tested as conical models having 10 degree half-angles with sharp points and with 0.064-in. nose radii. Results of these tests indicate that the Be is superior to BeCu as a heat-sink material. No burning of either material was observed during the test. (Author)

AD-255 716 Div. 9
(10 May 61) OTS price $1.50.

National Aeronautics and Space Administration, Washington, D. C.
TRANSONIC AERODYNAMIC CHARACTERISTICS OF A WING-BODY COMBINATION HAVING A 52.5 DEGREE SWEPTBACK WING OF ASPECT RATIO 3 WITH CONICAL CAMBER AND DESIGNED FOR A MACH NUMBER OF 1.1416,
by William B. Igoe, Richard J. Re, and Marlowe D. Cassetti. May 61, 51p. incl. illus. tables, (Technical note D-817)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-817.

DESCRIPTORS: Supersonic planes, Jet planes, Model tests, Lift, Drag, Aerodynamics, Moments, Stability, Supersonics, Transonics, Aerodynamic configurations, Airfoils, Wings, *Wing body configurations,

An investigation was made of the effects of conical wing camber and supersonic body indentation on the aerodynamic characteristics of a wing-body configuration at transonic speeds. Wing aspect ratio was 3.0, taper ratio was 0.1, and quarter-chord line sweepback was 52.5 with airfoil sections of 0.03 thickness ratio. The tests were conducted in the Langley 16-foot transonic tunnel at various Mach numbers from 0.80 to 1.05 at angles of attack from -4 to 14. The cambered-wing configuration achieved higher lift-drag ratios than a similar plane-wing configuration. The camber also reduced the effects of wing-tip flow separation on the aerodynamic characteristics. In general, no stability or trim changes below wing-tip flow separation resulted from the use of camber. The use of supersonic body indentation improved the lift-drag ratios at Mach numbers from 0.96 to 1.05. (Author)

AD-255 727 Div. 9, 2
(9 May 61) OTS price $2.60

New York U. Coll. of Engineering, N. Y.
LOCAL WIND CIRCULATIONS,
by Ben Davidson. Quarterly progress rept. no. 2, 1 Oct-31 Dec 60 on Preliminary Rept. on Flow over Local Obstacles. 31 Dec 60, 20p. incl. illus. tables.
(Contract DA 36-039-sc-84939, Proj. 3A99-07-001-03)
Unclassified report

DESCRIPTORS: *Meteorology, *Wind, Gas flow, Fluid mechanics, *Trees, Turbulence, Motion.

The structure of the local wind field was studied, with particular reference to the sea breeze, valley wind, and flow over obstacles. Theoretical approaches were developed which might lead to a more complete understanding of these phenomena. Analysis of a preliminary experiment designed to study the field of turbulence around a line of trees is presented. An experiment designed to study the field of turbulence around large scale obstacles is described and some preliminary data are given. (Author)

AD-255 739 Div. 9
(10 May 61) OTS price $1.60

Centre National d'Etudes et de Recherches Aeronautiques, Brussels, Belgium.
ANALYSIS OF THRUST DUE TO THE COANDA PHENOMENON,
by L. H. G. Stern. Final technical rept. Jan 61, 12p. incl. illus. (Rept. no. TCEA TR-8)
(Contract AF 61(052)384)
(ARL-26) Unclassified report

DESCRIPTORS: *Nozzles, Tests, *Aerodynamics, Thrust, *Jet mixing flow, Turbulence, Belgium.

Measurements of static thrust were made on a special nozzle designed and built by SFERI-Coanda, embodying the flow mechanism generally referred to as the Coanda effect. Thrust augmentations of up to 1.56 were found. (Author)

AD-255 741 Div. 9
(10 May 61) OTS price $7.60

Sferi-Coanda, Clichy (France).
ANALYSIS OF THRUST DUE TO THE COANDA PHENOMENON,
by Henri Coanda. 29 Oct 60, 1v. incl. illus. tables.
(Contract AF 61(052)382)
(ARL-27) Unclassified report

DESCRIPTORS: *Nozzles, *Aerodynamics, Tests, Thrust, France, *Jet mixing flow, Turbulence.

A study was made of the flow in a Coanda nozzle (in different sections and along the walls). The effective thrust of the nozzle (directly measured on a thrust balance) is compared with both the thrust computed from local measurements of pressure forces on the walls, and the thrust computed from the velocities and pressures in terminal planes.

AD-255 762 Div. 9
(11 May 61) OTS price $4.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
FORCE AND PRESSURE TESTS OF TWO ELLIPTIC OGIVE BODY SHAPES AT MACH NUMBERS 5, 6, AND 8,
by Jack L. Burk. Apr 61, 41p. incl. illus. table (Rept. no. AEDC TN 61-49)
(Contract AF 40(600)800)
Unclassified report

Division 9-FLUID MECHANICS

DESCRIPTORS: Pressure, Model tests, *Ogives, *Hypersonics, *Aerodynamics, Shock waves, Boundary layer, Instrumentation, Ellipsoids, Bodies of revolution, Load distribution, *Aerodynamic configurations, Hypersonic wind tunnels, Spark shadowgraph photography.

Tests were conducted at Mach numbers 5, 6, and 8 to obtain force and pressure distribution data for two elliptic ogives. The results presented show the effect of Mach number and Reynolds number variation on aerodynamic forces for angles of attack from -6 to +6 deg and on pressure distributions for angles of attack from -4 to +4 deg. Shadowgraphs obtained at various angles of attack show shock wave and boundary layer phenomena. (Author)

AD-255 764 Div. 9, 30
(11 May 61) OTS price $1.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
DAMPING MEASUREMENTS WITH A STING-SUPPORTED BEARING-PIVOT DYNAMIC BALANCE,
by C. J. Welsh, L. K. Ward, and R. H. Urban. May 61, 14p. incl. illus. (Rept. no. AEDC TN 16-52)
(Contract AF 40(600)800)
Unclassified report

DESCRIPTORS: *Damping, Pitch, *Re-entry aerodynamics, Test equipment, Dynamics, Stability, Hypersonic wind tunnels, *Conical bodies, Hypersonics, Cylindrical bodies, Hypersonic vehicles, Measurement, Model tests, Aerodynamic configurations.

Results of damping-in-pitch tests of a flared-afterbody re-entry shape are presented. Measurements using a sting-supported bearing-pivot system were made at free-stream Mach number equals 8 and over an amplitude range up to about 11 deg. (Author)

AD-255 850 Div. 9
(15 May 61) OTS price $1.00.

National Aeronautics and Space Administration, Washington, D. C.
MEASUREMENTS OF AERODYNAMIC HEAT TRANSFER AND BOUNDARY-LAYER TRANSITION ON A 10 DEGREE CONE IN FREE FLIGHT AT SUPERSONIC MACH NUMBERS UP TO 5.9,
by Charles B. Ramsey and Dorothy B. Lee. May 61, 33p. incl. illus. 10 refs. (Technical note D-745, Supersedes NACA Research Memo. L56B07, AD-92 127)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-745.

DESCRIPTORS: *Aerodynamic heating, *Heat transfer, Measurement, Supersonics, Flight testing, *Conical bodies, *Boundary layer, Reynolds number, Aerodynamic configurations, *Bodies of revolution,

The range of local Reynolds number was from 6.6 x 10 to the 6th power to 55.2 x 10 to the 6th power. In general, measurements were in good agreement with theory for cones. At a relatively constant ratio of wall temperature to local static temperature near 1.2, the transition Reynolds number increased from 9.2 x 10 to the 6th power to 19.4 x 10 to the 6th power as Mach number increased from 1.57 to 3.38. At Mach numbers near 3.7, the transition Reynolds number decreased as the skin temperature increased toward adiabatic wall temperature. (Author)

AD-255 851 Div. 9
(15 May 61) OTS price $1.50

National Aeronautics and Space Administration Washington, D. C.
NORMAL-FORCE AND HINGE-MOMENT CHARACTERISTICS AT TRANSONIC SPEEDS OF FLAP-TYPE AILERONS AT THREE SPANWISE LOCATIONS ON A 4-PERCENT-THICK SWEPTBACK-WING-BODY MODEL AND PRESSURE-DISTRIBUTION MEASUREMENTS ON AN INBOARD AILERON,
by Jack F. Runckel and Gerald Hieser. May 61, 55p. incl. illus. table (Technical note D-842, Supersedes NACA Research Memo. L59I23, AD-148 465)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-842.

DESCRIPTORS: *Ailerons, Moments, Pressure, Transonics, Wing-body configurations, Transonic wind tunnels, Model tests, Swept-back wings, Strain gages, Measurement, *Control surfaces, Load distribution.

An investigation was conducted at the Langley 16-foot transonic tunnel to determine the loading characteristics of flap-type ailerons located at inboard, midspan, and outboard positions on a 45 degree sweptback-wing-body combination. Aileron normal-force and hinge-moment data have been obtained at Mach numbers from 0.80 to 1.03, at angles of attack up to about 27 degrees, and at aileron deflections between approximately -15 degrees and 15 degrees. Results of the investigation indicate that the loading over the ailerons was established by the wing-flow characteristics, and the loading shapes were irregular in the transonic speed range. The spanwise location of the aileron had little effect on the values of the slope of the curves of hinge-moment coefficient against aileron deflection, but the inboard aileron had the greatest value of the slope of curves of hinge-moment coefficient against angle of attack and the outboard aileron had the least. Hinge-moment and aileron normal-force data taken with strain-gage instrumentation are compared with data obtained with pressure measurements. (Author)

AD-255 852 Div. 9, 25
(15 May 61) OTS price $1.50

National Aeronautics and Space Administration, Washington, D. C.
TURBULENT SKIN-FRICTION AND HEAT-TRANSFER COEFFICIENTS FOR AN INCLINED FLAT PLATE AT HIGH HYPERSONIC SPEEDS IN TERMS OF FREE-STREAM FLOW PROPERTIES,
by James F. Schmidt. May 61, 58p. incl. illus. tables, 18 refs. (Technical note D-869)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-869.

DESCRIPTORS: *Friction, *Heat transfer, *Turbulent boundary layer, *Gas flow, Reynolds number, Aerodynamic heating, Shock waves, Atmosphere entry, Fluid mechanics, Re-entry aerodynamics, Thermodynamics, Mathematical analysis, Hypersonic flow.

In order to provide simple (yet reliable) design calculations, the turbulent skin-friction and heat-transfer coefficients are presented in terms of the free-stream flow properties. Eckert's turbulent reference-enthalpy theory of skin friction and heat transfer is used for the calculations. These computations are compared

with the Deissler and Loeffler analysis revised to include the equilibrium dissociation effects in the boundary layer. A heat-transfer coefficient based on the free-stream kinetic energy is introduced as a design simplification. The skin-friction and heat-transfer coefficients are calculated for a flat plate at angles of attack ranging from 0 to 50 degrees with equilibrium dissociation of air behind the shock wave and within the boundary layer. These coefficients are tabulated for the following range of conditions: wall temperature, 1000 to 3000 R; free-stream velocity, 10,000 to 28,000 fps; and altitude, 50,000 to 300,000 feet. (Author)

AD-255 893 Div. 9
(16 May 61) OTS price $8.10

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.
SURFACE PRESSURE TESTS ON BLUNT SLAB WINGS SWEPT TO 0, 45, 60, AND 70 DEGREES AT MACH NUMBERS 1.71, 2.5, 4.0, 7.6 AND ANGLES OF ATTACK UP TO 40 DEGREES,
by Frank H. Durgin and Robert J. Polutchko.
Sep 60, 71p. incl. illus. tables. (Technical rept. no. 456)
(Contract AF 33(616)7246)
Unclassified report

DESCRIPTORS: *Supersonics, *Hypersonics, Aerodynamics, Model tests, Pressure, Aerodynamic configurations, *Wings, *Swept-back wings, *Swept wings, *Blunt bodies, Tests, Wind tunnel models, Compressible flow.

An experimental investigation of the two-dimensional surface pressures on blunt, swept, slab wings was conducted. The test was undertaken as part of a more general program in which the flow field behind a blunt slab wing at high angles of attack in supersonic and hypersonic flow is being studied. The purpose of the present test was to determine experimentally the effects of leading edge blunting and sweep and angle of attack on the surface pressure distribution of a flat plate. Four models having 0, 45, 60, and 70 degrees of leading edge sweep were built, instrumented with 16 to 18 pressure taps and tested at Mach numbers 1.71, 2.5, 4.0, and 7.6 through an angle of attack range of -24 to 40 degrees. Each wing has a 3/8 inch cylindrical leading edge and flat upper, lower, and base surfaces. Tabulated and graphical presentation of the pressure data is included. (Author)

AD-255 923 Div. 9
(15 May 61) OTS price $3.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
FORCE TESTS OF SEVERAL SHARP LEADING EDGE WING-BODY COMBINATIONS AT MACH 8,
by C. G. Burchfield. May 61, 26p. incl. illus. table (Rept. no. AEDC TN 61-46)
(Contract AF 40(600)900)
Unclassified report

DESCRIPTORS: *Wings, Model tests, Instrumentation, Hypersonic wind tunnels, Stability (Longitudinal), Stability (Lateral), Triangular wings, *Aerodynamics, *Hypersonics, Conical bodies, Shock waves, *Wing-body configurations, Hypersonic flow, *Aerodynamic configurations.

Experimental data were obtained on several, sharp leading edge, wing-body combinations to support a theoretical investigation by the Grumman Aircraft Engineering Corporation. Forces and moments were determined at Mach 8 and at a unit Reynolds number of 2 x 10 to the -6th power per foot. Data were also obtained on a few models at a Reynolds number of 0.8 x 10 to the -6th power per foot. All models were pitched from -10 to +20 deg. Two of the models were yawed from -3 to +15 deg while the pitch was held at a constant zero deg. (Author)

AD-255 954 Div. 9, 25
(15 May 61) OTS price $11.50

Illinois U. Engineering Experiment Station, Urbana.
AVERAGE TEMPERATURES AND TEMPERATURE FLUCTUATIONS BEHIND A HEATED WIRE,
by Glen F. Crum and Thomas J. Hanratty. Rept. on Exploration and Application of Turbulence Theory. Mar 61, 149p. incl. illus. tables (Technical rept. no. 11)
(Contract DA 11-022-ORD-1707, Proj. nos. 5B99-01-004 and TB2-001)
(OOR Rept. no. 1256:15) Unclassified report

DESCRIPTORS: Temperature, *Thermodynamics, *Aerodynamics, *Turbulent flow, Fluid flow, *Heat transfer, Mathematical analysis, Tests, *Gas flow, *Cylindrical bodies, Measurement, Instrumentation, Thermisters, Thermocouples, Wind tunnels, Statistical analysis, Theory, *Jet mixing flow, Heating elements, Air, Heat, Wire, Pipes, Wake.

The turbulent diffusion process in air was studied by measuring temperatures as a function of position in the wake of an electrically heated wire stretched across a round pipe. The Reynolds number based on the three-inch diameter of the pipe was ten thousand. Traverses were made behind a 0.0126-inch diameter wire at distances ranging from 0.10 inch to 18 inches. The time average temperature profiles and the mean-square fluctuating temperature profiles were measured by single resistance thermometers; and mean fluctuating temperature products by two resistance thermometers separated by from 0.026 to 0.608 inches. The data were compared to Taylor's single-particle diffusion theory; to Batchelor's particle-pair and particle-cloud diffusion theory; to Townsend's analysis of diffusion from a line source in homogeneous turbulence; and to smooth and rough wandering plume models. A structural function (after Obukhov) was also calculated. (Author)

AD-255 956 Div. 9
(15 May 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
ANALOG-COMPUTER INVESTIGATION OF EFFECTS OF FRICTION AND PRELOAD ON THE DYNAMIC LONGITUDINAL CHARACTERISTICS OF A PILOT-AIRPLANE COMBINATION,
by Harold L. Crane. May 61, 47p. incl. illus. tables (Technical note no. D-884; Supersedes NACA RM L57I18, AD-146 630)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-884.

DESCRIPTORS: Friction, *Control systems, Mathematical analysis, *Control, Stability, Stability (Longitudinal), Simulation, *Airplanes, *Fighters, Analog computers, Servo systems.

With an analog computer, an investigation was made of the effects of stick pivot friction and servo valve friction on the longitudinal response of a fighter airplane. The results indicated that very small amounts of valve friction caused hunting oscillations of the piloted airplane when a small attitude correction was attempted. It was found that partial compensation for the effects of valve friction resulted from the presence of either stick friction or preloaded centering of the servo valve or the stick. (Author)

AD-255 975 Div. 9
(15 May 61) OTS price $5.60

St. Anthony Falls Hydraulic Lab., U. of Minn., Minneapolis.
LIFT AND DRAG ON SURFACE-PIERCING DIHEDRAL HYDROFOILS IN REGULAR WAVES,
by Lorenz G. Straub, J. M. Wetzel, and F. R. Schiebe. Sep 60, 45p. incl. illus. tables.
(Proj. rept. no. 64)
(Contract Nonr-71032) Unclassified report

DESCRIPTORS: *Hydrofoils, Lift, Drag, *Hydrodynamics, *Water waves, Harmonic analysis, Oscillation, Dynamometers, Interference, Tests.

Experimental measurements were made of the lift and drag of a restrained surface-piercing dihedral hydrofoil in regular head and following seas. Two velocities and a variety of wave lengths and amplitudes were used. The oscillatory lift was predicted with fair success using linearized theory as developed by Ogilvie. The experimental forces were observed to contain harmonic distortion, and comparison of the second harmonic component obtained from nonlinear quasi-steady theory indicated that the calculated values were too low. No theory was available for comparison with the oscillatory drag forces. Tests with a restrained tandem dihedral configuration in smooth water indicated that the performance ratio of the aft foil could be considerably increased for a particular separation of the foils. The optimum separation increased with increasing velocity. A brief series of tests were made in head seas using the optimum foil separation, and little difference between the tandem foils and single foil was noted for the oscillatory lift component. (Author)

10. FUELS AND COMBUSTION

AD-255 145 Div. 10, 26, 27
(4 May 61) OTS price $7.60.

Wyle Research Corp., El Segundo, Calif.
PROBLEMS ENCOUNTERED DURING INSTALLATION AND OPERATION OF A STORABLE PROPELLANT FACILITY FOR TESTING OF TITAN II COMPONENTS AND SYSTEMS.
7 Mar 61, 66p. incl. illus. 27 refs. (Technical note no. 10235)
(Contract AF 04(647)398)
(AFBMD TN 61-32) Unclassified report

DESCRIPTORS: *Liquid rocket propellants, *Storage, Handling, Safety, Protective clothing, *Hydrazines, *Methyl hydrazines, Nitrogen compounds, Tetroxides, *Rocket oxidizers, *Rocket fuels, Contamination, Corrosion, Lubricants, Seals, Gaskets, Polymers, Ethylenes, Fluorides, Materials, Test equipment, Test facilities,

The design and operation of a storable propellants test facility utilizing N2O4 and the Titan II UDMH-N2H4 fuel blend as the fluid media are discussed. Two 6,000-gal stainless steel tanks provided fuel blend storage and similar tanks to store the N2O4. The blending system consisted of a 6,000-gal tank, two 260-gpm pumps for recirculation, and a high turbulence blender. The toxicity of the storable propellants necessitated the inclusion of aspirators, N purge connections, liquid drain valves and isolation valves to facilitate removal of components from the test sections. Similar precautions were provided for component removal from the fuel and oxidizer systems. Waste propellant liquid and vapor neutralization, material compatibility, contamination, leakage, lubricants, seals, and materials are discussed.

AD-255 162 Div. 10, 25
(2 May 61) OTS price $2.60

TALCO Div., Gabriel Co., Pasadena, Calif.
THERMODYNAMICS OF REACTIONS INVOLVING LIGHT METAL OXIDES AND PROPELLANT GASES.
Quarterly rept. no. 3, 9 Nov-9 Feb 61. 9 Feb 61, 1v. incl. illus. tables, 23 refs. (Rept. no. QR-1987-3)
(Contract DA 04-495-ORD-1987)
(ARPA Order no. 40-60) Unclassified report

DESCRIPTORS: *Solid rocket propellants, Evapotranspiration, *Thermodynamics, *Boron compounds, Metallic compounds, *Aluminum compounds, Oxyfluorides, *Oxyhalides, Heat of formation, Temperature, Gases, Chemical reactions, Oxides, Theory, Heat of reaction, Fluorides.

The heat of formation of the trimer (BOF)3(g) has been confirmed by transpiration experiments at 1000 K for the reaction B2O3(l) + BF2(g) equals (BOF)3(g). Employing the latest available thermodynamic data for the heats of formation of B2O3 and BF3 values for H sub f298K equals -567.8 + or - 0.5 kcal/mole and S sub 298K equals 89.9 + or - 2 cal-degree/mole for the trimer (BOF)3(g) are reported. Employing a new experimental technique, molecular flow reaction studies, a preliminary heat of formation H sub f298K of -145 + or - 5 kcal/mole is reported for the monomer BOF. (Author)

AD-255 206 Div. 10, 12
(3 May 61) OTS price $2.60

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
A RADIAL IGNITION SYSTEM FOR BURNING RATE STUDIES,
by A. Nagar. Feb 61, 26p. incl. illus. tables
(Rept. no. R-1556)
(WADD TR 60-460) Unclassified report

DESCRIPTORS: *Propellant grains, *Combustion, *Ignition, *Ignition systems, Igniters, Diffusers, Blast, Attenuation, Gas flow, *Solid rocket propellants, *Propellants, *Explosive actuators, Combustion chambers, Fragmentation, Design, Tests, Gases.

During the ignition process of propellants for

burning rate studies, some grains were inadvertently shattered as they were hurled against the chamber walls. This grain shattering resulted in erratic increases in propellant surface area, radical changes in grain configuration and irregularly peaked pressure-time relations. This condition was rectified by replacing the straight-through ignition system with a newly designed radial ignition system. In the latter, propellant grains are ignited by an array of hot gases streaming through holes in the diffuser walls. These gases enter the chamber circumferentially, thereby immobilizing the grains during the ignition process; for each stream of igniter gas imparting motion to the grains, there is an equal and opposite counter stream tending to stabilize the grains. The net result is a smooth and uniform ignition throughout the process which is devoid of propellant grain shatter, the prime objective of this endeavor. (Author)

AD-255 269 Div. 10
(4 May 61) OTS price $1.60

Aeronutronic, Newport Beach, Calif.
STUDY OF DETONATION BEHAVIOR OF SOLID PROPELLANTS,
by Ray Grandey and M. Boyer. Quarterly rept. no. 14. 20 Apr 61, 17p. incl. illus. table (Publication no. U-1229)
(Contract NOrd-17945)
Unclassified report

DESCRIPTORS: *Solid rocket propellants, *Detonation, *Ignition, Combustion, Theory, *Propellant grains, Detonation waves, Thermodynamics, Pressure, Thermal radiation, Programming, Computers, Mathematical analysis, Velocity.

Theoretical studies of pressure initiated and thermally initiated detonation are presented. In the former case, the one-dimensional computer program was used for examination of the effects of material parameters upon detonation. These parameters are concerned with the grain size and effective grain size. The initial pressure effect of 0.04 megabars produced a wave which slowly approached, but never quite attained the velocity reached in an identical material with more intense initiation. A 2-dimensional hydrodynamic computer program is available for problems concerned with charge geometry. The computer program for thermally initiated detonation is nearing operational status.

AD-255 748 Div. 10
(9 May 61) OTS price $2.60

TAPCO West Coast Engineering, Thompson Ramo Wooldridge, Inc., Inglewood, Calif.
INVESTIGATION OF AUTOIGNITION AND OTHER PHENOMENA IN HIGH TEMPERATURE AIRCRAFT FUEL SYSTEMS,
by R. Wolfshagen. Progress rept. no. 3, 15 Oct 60-15 Feb 61. 15 Mar 61, 22p. incl. illus. tables. (Engineering rept. no. ING ER 293)
(Contract AF 33(616)7137, Proj. 3084)
Unclassified report

DESCRIPTORS: *Jet engine fuels, Aviation fuels, Ignition, Supersonic planes, Gases, Combustion, Fuel systems, *Fuel tanks, Aerodynamic heating, Pressure, Temperature, Test equipment, *Jet planes, Test methods, Test facilities.

The investigation of autoignition phenomena in high temperature aircraft fuel tanks was continued and a Phase I test series was conducted in the laboratory bench scale test rig to investigate the relative importance of variables believed to affect autoignition. On the basis of results obtained, a Phase II test program is underway to further evaluate the most significant variables defining autoignition under conditions simulating those encountered in typical high temperature aircraft fuel systems. This program includes both dive and aerodynamic heat up type tests. The Phase II dive tests have been completed and results are reported. (Author)

AD-255 962 Div. 10, 26
(15 May 61) OTS price $2.60

Naval Ordnance Test Station, China Lake, Calif.
EFFECT OF PROCESS VARIABLES ON THE DIMENSIONS AND QUALITY OF EXTRUSION-COATED PROPELLANT GRAINS,
by H. F. Metcalf, Rodney Sutherland and others. Dec 60, 22p. incl. illus, tables. (NOTS TP 2597) (NAVWEPS Rept. no. 7604) Unclassified report

DESCRIPTORS: *Propellant grains, *Coatings, *Plastic coatings, Cellulose, Ethyl cellulose, *Extrusion, *Encapsulation, Processing, Manufacturing methods, Quality control, Solid rocket propellants, Machine tools.

The second phase of an experiment to evaluate an extrusion-coating process for inhibiting rocket-propellant grains with ethylcellulose is described. The objectives of this phase of the experiment are to apply a set of chosen operating conditions in the 2 1/2-inch extruder and to consider the effect of eight additional process factors on the quality and dimensions of the inhibited propellant grains. Data resulting from these applications are presented in tabular and graphical form, and an interpretation of the data is included in the text. (Author)

AD-255 964 Div. 10, 9, 25, 27
(15 May 61) OTS price $9.60

James Forrestal Research Center, Princeton, U., N. J.
PROJECT SQUID, A COOPERATIVE PROGRAM OF FUNDAMENTAL RESEARCH AS RELATED TO JET PROPULSION FOR THE OFFICE OF NAVAL RESEARCH, DEPARTMENT OF THE NAVY,
Semi-annual progress rept. 1 Oct 60-30 Mar 61. 1 Apr 61, 115p. incl. illus. tables, 62 refs.
(Contract Nonr-185825, Proj. NR-098-038)
Unclassified report

DESCRIPTORS: *Fluid mechanics, Transport properties, *Gas flow, Gases, High temperature research, *Reaction kinetics, *Plasma physics, *Combustion, *Jet propulsion, Plasma jets, Thermodynamics, Chemical reactions, Turbulent flow, Solids, Heat transfer, Liquids, Magnetohydrodynamics, High pressure research, Flames, Detonation, Solid rocket propellants, Theory.

Contents:
Nonsteady and Nonequilibrium Flow; Partially-Ionized Gases in the Presence of Electromagnetic Fields; Thermodynamic and Transport Properties of Gases; Statistical Properties of 2-Phase Flow; Thermal Conductivity of Gases and Liquids; Fluid Flow with Suspended Particles; Elementary Reactions in Combustion; Reaction Kinetics in High-Temperature Gases; Chemical Kinetics and Gas Dynamics of Surface-Catalyzed Atom and Free-Radical Reactions; Inelastic Molecular Colli-

sions; Solid-propellant Flame Mechanisms; Initiation of Spherical Detonations by Electric Discharge; Transport Properties at High Temperature and of Gaseous Combustion; Magnetohydrodynamics of Partially Ionized Gases; Fluctuations in Plasma Jets; Flame Structure and Burning Characteristics of Model Compounds Representing High-Energy Propellants; and Plasmaflow in Nozzles.

AD-255 993 Div. 10, 4
(17 May 61) OTS price $3.60

Armour Research Foundation, Chicago, Ill.
FUNDAMENTALS OF LIQUID PROPELLANT SENSITIVITY,
by T. A. Erikson and E. L. Grove. Quarterly rept. no. 3, 22 Dec 60-21 Mar 61. 3 May 61, 34p. incl. illus. (Rept. no. ARF 3180-10)
(Contract NOw 60-0431-c)

Unclassified report

DESCRIPTORS: *Liquid rocket propellants, Nitrates, Stability, Sensitivity, Detonation, Test methods, Test equipment, Shock tubes, Photolysis, Nitroglycerin, Nitro radicals, Methanes, Propyl radicals.

Two experimental techniques are being used to study the sensitivity of liquid propellant systems: (1) pure environmental shock testing and (2) flash photolysis. Progress on the shock tube phase has been hindered by the inability to obtain reproducible results with nitroglycerine as the test system. Although some of the difficulties were traced to the instrumentation, others are still unresolved. Chlorine heptoxide, which is more sensitive than nitroglycerine, will be used in tests designed to identify and control the variables in the shock-initiated detonation process. Nitroglycerine, nitromethane and propylnitrate are the liquid systems being used in the flash photolysis study. Nitroglycerine irradiated by an ultraviolet source initially fumes and ultimately either decomposes or explodes, depending on the time and intensity of the irradiation. These results lead to the conclusion that thermal degradation of the light energy occurs in the initiation process. Comparisons between the application of thermal theory and such photolytic initiations appear to support this conclusion. (Author)

11. GROUND TRANSPORTATION EQUIPMENT

AD-255 306 Div. 11
(5 May 61) OTS price $7.60

Aberdeen Proving Ground, Md.
ROAD SHOCK AND VIBRATION TEST OF SPARE-PARTS REPOSITORY (USMC)
by P. P. McKay. May 61, 1v. incl. illus. tables, (Rept. no. DPS-214)

Unclassified report

DESCRIPTORS: *Maintenance vehicles, *Cargo vehicles, Tests, Vibration, Shock resistance, *Maintenance equipment.

A preproduction model of the spare-parts repository (USMC) was installed on a standard M35 cargo truck and subjected to five test laps on each of the vibration test courses in the Munson Area, and 1000 miles of endurance tests on the Perryman cross-country course. The object of this test was to determine the shock and vibration environment encountered, the adequacy of the tie-downs used, and the ability of the repository to withstand the environment of road transportation and extended field operation when mounted on the M35 truck. The spare-parts repository completed the tests satisfactorily and the test results indicate that it is capable of withstanding the environment of road transport and extended field operations on the M35 truck when secured to the truck with the tie-down slings provided. (Author)

AD-255 817 Div. 11
(10 May 61) OTS price $3.60

Aberdeen Proving Ground, Md.
TEST OF TRAILER, CARGO: 1/4-TON, 2-WHEEL, XM416E1,
by P. Laichinger. May 61, 1v. incl. illus. (Rept. no. DPS-224)
(Proj. 546-07-017)

Unclassified report

DESCRIPTORS: *Trailers, *Cargo vehicles, Tests, Vehicles, Towing cables, Tow bars, Vehicle wheels, Design, Reliability.

The XM416E1 trailer was tested to determine its compatibility with the M151 truck and its durability. The trailer was towed 6479 miles on various test courses by an M151 truck. Observations were made of the performance of the trailer, and of the ability of the M151 truck to tow the trailer. The trailer was proved to be compatible with the M151 truck. Deficiencies in general were minor in nature. Most difficulty was experienced with wear of suspension components. It is recommended that upon correction of the deficiencies listed, the trailer be considered acceptable for military use. (Author)

12. GUIDED MISSILES

AD-255 000 Div. 12, 6
(2 May 61) OTS price $9.10

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
LUNAR TRAJECTORY STUDIES AND AN APPLICATION TO LUNIK III TRAJECTORY PREDICTION,
by A. Petty and I. Jurkevich. July 60, 1v. incl. illus. tables, 12 refs. (Scientific rept. no. 1; Supersedes AD-247 577)
(Contract AF 19(604)5863)
(AFCRL TN 60-1132) Unclassified report

DESCRIPTORS: *Lunar probes, Moon, Errors, *Satellite vehicle trajectories, *Programming, *Radar tracking, Differential equations, Digital computers.

A summary is given of technical accomplishments pertaining to three relatively closely connected areas: (1) design of a fast, accurate, and efficient computer program for computation of lunar trajectories; (2) an application of the resulting computer program to an error analysis of specific lunar trajectories and to the determination of some actual trajectories (as an example the trajectory of LUNIK III is considered in detail); and (3) tracking program (determination of initial conditions to be used in the equations of motion). (Author)

AD-255 078 Div. 12
(3 May 61) OTS price $4.60

RCA Service Co., Inc., Patrick Air Force Base, Fla.
PERTURBATIONAL CONSTRUCTION OF RE-ENTRY TRAJECTORIES FOR IMPACT PREDICTION AND RADAR ACQUISITION,
by Raul R. Hunziker. 15 Oct 60, 46p. incl. illus. tables (Systems analysis technical rept. no. 13)
(AFMTC TR 61-3) Unclassified report

DESCRIPTORS: *Re-entry aerodynamics, *Atmosphere entry, Perturbation theory, Differential equations, Numerical analysis, *Flight paths, Guided missile trajectories, Satellite vehicle trajectories, Mathematical prediction, Radar, Detection.

Re-entry trajectories are constructed using a special perturbation procedure based on PICARD's method of successive substitutions by departing from a zero order or reference path. The reference path for the real time impact prediction case is a closed form rectilinear trajectory. For the high precision calculations of radar acquisition the zero order path is the planned path plus constant increments to match the radar observed re-entry initial conditions. Numerical constructions of the first order solutions for relatively large values of the perturbations in the initial conditions show that the end figure errors are sufficiently small. These procedures are conducive to the small total computing times which are essential for real time impact or sequential position prediction. (Author)

AD-255 182 Div. 12, 15
(3 May 61) OTS price $9.10.

Air Force Missile Development Center, Holloman Air Force Base, N. Mex.
A WEIGHTED LEAST-SQUARES DETERMINATION OF THE UNPERTURBED ORBITAL ELEMENTS WHICH COMBINES VARIOUS TYPES OF OBSERVATIONAL DATA,
by Charles A. Bodwell. March 61, 98p. incl. illus. (Rept. no. AFMDC TR 61-2)
Unclassified report

DESCRIPTORS: *Least squares method, *Guided missile trajectories, *Satellite vehicle trajectories, Determination, *Orbital flight paths, Statistical analysis, Velocity, Numerical methods and procedures, Landing, Launching sites, Terminal ballistics, Experimental data, Exterior ballistics, Mathematics.

A method is presented, without recourse to numerical integration, for using almost any combination of number and type of observations from any number of observational sites in determining: (1) the weighted least-squares unperturbed orbital elements of either satellites or of ICBMs; (2) whether the data are indicative of a satellite or of an ICBM (for an ICBM the procedure for determining the times and locations of the unperturbed launch and impact points is given); (3) the ground trace and height of the trajectory with respect to any desired ellipsoid of revolution; and (4) the apparent velocity vector of the missile with respect to any given Local Horizon Coordinate System. (Author)

AD-255 200 Div. 12, 9, 22
(3 May 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL EVALUATION OF ANALYTICAL MODELS FOR THE INERTIAS AND NATURAL FREQUENCIES OF FUEL SLOSHING IN CIRCULAR CYLINDRICAL TANKS,
by Robert W. Warner and John T. Caldwell. May 61, 35p. incl. illus. 14 refs. (Technical note D-856)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-856.

DESCRIPTORS: Mathematical analysis, *Rockets, Mechanics, *Hydrodynamics, *Guided missiles, Frequency, *Fuel tanks, Launching, Stresses, Load distribution, Oscillation, Stability, Simulation, *Rocket fuels, *Propellant tanks, *Liquid rocket propellants, Tests.

A correlation is presented of experimental measurement and analytical prediction of free, planar oscillations of a tank of mercury hung on a pendulum. Measured frequencies are presented for the slosh mode and the pendulum-tank mode, and time-history wave forms are included for qualitative comparisons. The sloshing is represented analytically by a single pendulum or a spring-bob, and the size and location of their inertias are determined by matching forces and moments on the tank surface with linearized hydrodynamic theory for inviscid fluids. It is concluded that such analytical models are identical for small displacements in the present application (as they are in simpler applications) and that they provide excellent simulation of the stiffness and inertia terms for fuel sloshing. (Author)

AD-255 204 Div. 12, 2
(3 May 61) OTS price $4.60

Pitmann-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
BASIC INVESTIGATION OF THE OPERATION OF PROPELLANT ACTUATED DEVICES IN SPACE ENVIRONMENT.

PHASE I, A LITERATURE SURVEY,
by Gilbert H. Skopp. Nov 60, 46p. incl. illus. tables (Rept. no. R-1545)
(WADD TR 60-346) Unclassified report

DESCRIPTORS: *Space environmental conditions, Space capsules, *Space flight, Spaceships, Satellite vehicles, Hypervelocity vehicles, Guided missiles, Rockets, Atmosphere, Nuclear propulsion, Upper atmosphere, Radioactivity, Ionosphere, Astronautics, Jet acoustic oscillation, Temperature, *Bibliography, *Explosive actuators, Ejection, Catapults, Spaceship cabins, Propellants.

Phase I of this program entails a compilation of the environments and a bibliography pertaining to the environments of space operations. The weapon systems subjected to the hyperenvironments are classified into short duration (1 to 2 hr) flying-type and ballistic-type vehicles operating from a 75,000 to 300,000 ft altitude range, and into long-duration satellite vehicles orbiting around the earth in the 200- to 400-mi altitude range. Sustained flight, boost glide, ballistic, and satellite vehicles are included in these considerations. The natural environmental conditions considered are categorized under, atmospheric composition, extreme high vacuum, solar radiation, ozone, dissociated gases, aurorae, ionized gases, solid particles, magnetic field, cosmic radiation, and low temperature. The induced environments are categorized under high temperature, acceleration, vibration, acoustical excitation shock, zero gravity, and nuclear irradiation.

AD-255 205 Div. 12, 2
(3 May 61) OTS price $3.60

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
BASIC INVESTIGATION OF THE OPERATION OF PROPELLANT ACTUATED DEVICES IN SPACE ENVIRONMENT. PHASE II, A THEORETICAL STUDY,
by Gilbert H. Skopp. Nov 60, 33p. incl. illus. tables, 23 refs. (Rept. no. R-1546)
(WADD TR 60-347) Unclassified report

DESCRIPTORS: *Space environmental conditions, *Space flight, Spaceships, Safety devices, Satellite vehicles, Rockets, Astronautics, Guided missiles, Space capsules, Ballistics, Mechanics, Ignition, Materials, Ejection, Hypervelocity vehicles, Spaceship cabins, Catapults, *Explosive actuators, Materials, Heat resistant alloys, Propellants, Rocket fuels, Solid rocket propellants,

Preliminary studies were conducted on the environmental effects on standard propellant actuated devices (PAD) with respect to ballistic performance and mechanical properties. Included were the escape system mechanisms with emphasis on environmental conditions at 75,000 to 300,000 ft autoignition and materials studies. Charts are included which summarize the projected performance of standard PAD at altitudes up to 300,000 ft and for altitudes above 300,000 ft. Consideration was given to effects of such natural environments as atmospheric composition extremely high vacuum, solar radiation, ozone, dissociated gases, aurorae, ionized gases, solid particles, magnetic field, cosmic radiation, and low temperatures; inducted environment considerations included high temperature, acceleration, vibration, acoustic excitation, shock, zero gravity, nuclear radiation, and combined environments.

AD-255 297 Div. 12, 6, 11, 24, 30
(4 May 61) OTS price $2.60

RCA Service Co., Inc., Patrick Air Force Base, Fla.
AMR INFRARED VAN,
by D. C. Marquis, R. L. Carney, and J. Sibol. Engineering rept. 24 Feb 61, 16p. incl. illus. (Subcontract to Pan American World Airways, Inc., New York)
(AFMTC TN 61-3) Unclassified report

DESCRIPTORS: *Guided missiles, Surface to surface, Infrared equipment, *Infrared tracking, Radiometers, Photographic equipment, Television equipment, Sulfides, *Televison tracking systems, Magnetic recording systems, *Infrared optical systems, *Optical tracking, *Guided missile tracking systems, Measurement, Mathematical analysis, Thermistors, Lead compounds, Data, Instrumentation, Spectrographic data, Collecting methods, *Data processing systems, *Radar trailers.

A description of the infrared measurements program at AFMTC is given. The equipment, the operation and the data reduction methods are explained. This system is a three-channel system employing a two-channel eight-inch radiometer and a one-channel four-inch radiometer. The coverage of each channel is as follows: Channel A uses a thermistor detector with KRS-5 window whose unfiltered response is from 0.6 to 35 microns. Channel B uses a PbS detector with germanium window whose response is from 1.8 to 2.7 microns. Channel C uses a thermistor detector with sapphire window whose unfiltered response is from 0.6 to 6 microns. The data is reduced by a routine called FIRE. An explanation of the methods and formulas used for obtaining range, aspect angle, altitude, radiant flux, irradiance, and apparent radiant intensity is given. The method used for calculating the atmospheric attenuation is based on the Taylor and Yates measurements. The equipment is used on all ballistic missile launchings from Cape Canaveral and adjacent waters. (Author)

AD-255 370 Div. 12
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ROADS INTO COSMOS (Dorogi V Kosmos)
by A. G. Karpenko. 18 Oct 60, 16p. (Trans. no. MCL-329 from Zvezda 10:154-162, 1958)
Unclassified report

DESCRIPTORS: *Astronautics, Space flight, Rocket motors, Rocket fuels, Theory, USSR.

AD-255 419 Div. 12, 9, 17, 22
(7 May 61) OTS price $3.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
A VISCO-PLASTIC MODEL FOR HYPERVELOCITY IMPACT,
by T. D. Riney. Quarterly rept. no. 1, 3 Nov 60-3 Feb 61, on Theory of High Speed Impact. Apr 61, 28p. incl. illus., 21 refs.
(Contract AF 08(635)1713, Proj. 9860)
(APGC TN 61-16) Unclassified report

DESCRIPTORS: Mathematical analysis, *Hypervelocity projectiles, Penetration, *Space flight, Materials, Viscosity, Plastic flow, Deformation, Axially symmetric flow, Aluminum, Aluminum alloys, Steel, Lead, Cratering, *Spaceships, Copper, Tungsten compounds, Carbides, Tests, Hazards, *Satellite vehicles, Space environmental conditions, Aerial targets, *Guided missiles, Surface to surface, Meteorites.

Existing experimental results of hypervelocity impact tests were gathered from various sources and the composite data is presented and discussed. The extrapolated results to higher velocities are seen to differ with the theoretical prediction from the hydrodynamical model of R. L. Bjork. Re-examination of his assumptions and the experimental results indicate the desirability of including the effects of the viscosity and the strength of the materials into the mathematical model. A visco-plastic model was formulated to meet these requirements. (Author)

AD-255 525 Div. 12, 9
(8 May 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
AERODYNAMIC CHARACTERISTICS IN PITCH AND SIDESLIP OF 1/15-SCALE MODEL OF THE SCOUT VEHICLE AT A MACH NUMBER OF 2.01,
by Ross B. Robinson. May 61. 37p. incl. illus. (Technical note D-793)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-793.

DESCRIPTORS: Supersonics, *Aerodynamics, *Aerodynamic configurations, *Satellite vehicles, Model tests, Pitch, Fins, Supersonic wind tunnels, Supersonic flow, Stability (Longitudinal), Stability (Lateral), *Research test vehicles, Rocket models.

The effects of two sets of cruciform fins, of inline and indexed fin arrangements, a flare, and accessories such as antennas, launch fittings, and control tunnels on the aerodynamic characteristics of the configuration were measured for combined angles of attack and sideslip to about 8 degrees. The investigation was made in the Langley 4- by 4-foot supersonic pressure tunnel at a Reynolds number of 4 x 10 to the 6th power per foot. (Author)

AD-255 526 Div. 12, 9
(8 May 61) OTS price $1.75

National Aeronautics and Space Administration, Washington, D. C.
TRANSONIC WIND-TUNNEL INVESTIGATION OF THE STATIC LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF SEVERAL CONFIGURATIONS OF THE SCOUT VEHICLE AND OF A NUMBER OF RELATED MODELS,
by Thomas C. Kelly. May 61. 69p. incl. illus. (Technical note D-794)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-794.

DESCRIPTORS: Transonic wind tunnels, *Aerodynamic configurations, *Aerodynamics, Stability (Longitudinal), Drag, Pitch, Fins, Model tests, *Satellite vehicles, *Research test vehicles, Rockets, Rocket models, Wind tunnel models.

Tests were conducted in the Langley 8-foot transonic pressure tunnel at Mach numbers from 0.40 to 1.20 and Reynolds numbers per foot of approximately 3.8 x 10 to the 6th power to determine the static longitudinal aerodynamic characteristics of a 1/15-scale model of the Scout vehicle and of several related configurations. Results are presented which show, for various models, the effects of fin planform, protuberances, an afterbody flare, and a variation in second-stage transition-flare angle. (Author)

AD-255 528 Div. 12
(8 May 61) OTS price $1.00.

National Aeronautics and Space Administration, Washington, D. C.
EFFECTS OF MASS-LOADING VARIATIONS AND APPLIED MOMENTS ON MOTION AND CONTROL OF A MANNED ROTATING SPACE VEHICLE,
by William D. Grantham. May 61, 40p. incl. illus. tables. (Technical note D-803)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-803.

DESCRIPTORS: *Satellite vehicles, Manned, Motion, *Rotation, Damping, Oscillation, Roll, Rotating structures, Spaceship cabins, Gravity, *Spaceships, Space environmental conditions, Moments,

An analytical study has been made to determine the effects of mass-loading variations on a hypothetical earth-satellite space station, rotating to provide an artificial gravity. Results indicate that the shifting of masses within the rotating craft could bring about large oscillations in the attitude angles and in some cases the craft could even diverge about an axis other than the axis of initial rotation. Constant-rate inertia wheels and jet-reaction moments can be used to minimize the undesirable motions. (Author)

AD-255 533 Div. 12, 15, 19
(8 May 61) OTS price $10.50

National Aeronautics and Space Administration, Washington, D. C.
AN ANALYSIS OF ERRORS AND REQUIREMENTS OF AN OPTICAL GUIDANCE TECHNIQUE FOR APPROACHES TO ATMOSPHERIC ENTRY WITH INTERPLANETARY VEHICLES,
by David P. Harry, III and Alan L. Friedlander. 1961, 131p. incl. illus. tables, 24 refs. (Technical rept. no. R-102)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical rept. R-102.

DESCRIPTORS: Spaceships, *Space flight, Guidance, *Atmosphere entry, Planets, *Planetary atmosphere, Astrophysics, *Optical systems, Digital computers, *Numerical methods and procedures, Errors.

An analysis and Monte Carlo statistical evaluation of a potentially self-contained guidance scheme based on a clock and optical instrumentation are presented. Finite errors in all measurements and control action are considered, as well as planet surface knowledge. Requirements on system components are inferred from parametric studies. A range of entry velocities from 40,000 to 63,000 fps, entry corridors as small as a 8 mi., and instrument accuracies from 20- to 120-sec arc are considered. A multiple-correction scheme is found capable of controlling the approach to an entry corridor using instruments of modest capability and requiring a relatively small corrective velocity increment. (Author)

AD-255 667 Div. 12, 6
(9 May 61) OTS price $3.60

Electronic Defense Labs., Mountain View, Calif.
PROBABILITY PROBLEMS IN DETECTING MISSILE SALVOS,
by Richard Barlow. 12 Feb 60, 32p. incl. illus. table. (Technical memo. no. EDL-M257)
(Contract DA 36-039-sc-78281)
Unclassified report

DESCRIPTORS: *Guided missiles, *Detection, Probability, Statistical analysis, *Detectors, Statistical processes, Effectiveness.

Various models describing missile arrivals resulting from a salvo attack are discussed. The effectiveness of detecting equipment which has an operative delay after each missile detection is considered. The probability of seeing a given percentage of the missise salvo is obtained for random missile arrivals. The distribution of the time lag in generating a warning is obtained for detection equipment with a given detection reliability. (Author)

AD-255 712 Div. 12, 1
(11 May 61) OTS price $1.50

National Aeronautics and Space Administration, Washington, D. C.
AERODYNAMIC CHARACTERISTICS OF PARACHUTES AT MACH NUMBERS FROM 1.6 TO 3,
by Julian D. Maynard. May 61, 55p. incl. illus. tables (Technical note D-752)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-752.

DESCRIPTORS: Supersonic wind tunnels, Porosity, Porous materials, *Parachutes, Recovery, Drag, Stability, *Parachute descents, Ribbon parachutes, Schlieren photography, Rotorchutes, Tests, Free fall missiles, *Aerodynamics, Supersonics, High speed photography, Guided missiles, Model tests, Booster rockets, Satellite vehicles, Deceleration.

A wind-tunnel investigation was conducted to determine the parameters affecting the aerodynamic performance of drogue parachutes in the Mach number range from 1.6 to 3. Flow studies of both rigid- and flexible-parachute models were made by means of high-speed schlieren motion pictures and drag coefficients of the flexible-parachute models were measured at simulated altitudes from about 50,000 to 120,000 feet. Porosity and Mach number were found to be the most important factors influencing the drag and stability of flexible porous parachutes. Such parachutes have a limited range of stable operation at supersonic speeds, except for those with very high porosities, but the drag coefficient decreases rapidly with increasing porosity. (Author)

AD-255 718 Div. 12, 9
(11 May 61) OTS price $0.75

National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL INVESTIGATION OF STAGE SEPARATION AERODYNAMICS,
by Robert A. Wasko. May 61, 24p. incl. illus. (Technical note D-868)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-868.

DESCRIPTORS: *Guided missiles, Model tests, *Guided missile boosters, Aerodynamics, *Supersonics, Pressure, Launching, *Staging, *Rocket motors, Cylindrical bodies, Aerodynamic configurations.

Interstage aerodynamic pressures on a two-stage missile model with a cold-air simulated second-stage rocket motor were investigated over a range of separation distances to 3 second-stage body diameters at Mach 2 and a pressure altitude of 38,000 ft in the 8- by 6-ft tunnel. Effects of stage center-line misalinement were also studied. First-stage interference effects produced higher-than-ambient second-stage base pressures over a longer separation distance for jet-off staging than for jet-on. Ports in the interstage fairing for jet-on staging reduced the range of interference effects and also reduced but did not eliminate fluctuating second-stage base and afterbody pressures. (Author)

AD-255 766 Div. 12, 27
(10 May 61) OTS price $9.10

Space Recovery Systems, Inc., El Segundo, Calif.
STUDY OF SOFT RECOVERY,
by T. W. Knacke, K. R. Paulson, and G. G. Schurr. Mar 61, 92p. incl. illus. tables, 31 refs.
(Contract AF 29(600)2454, Proj. 7856)
(AFOSR-104) Unclassified report

DESCRIPTORS: *Recovery, *Test vehicles, Inertial guidance, *Guided missile boosters, *Booster rockets, Recovery vehicles, Drag, Parachutes, Helicopters, Test equipment, Flight paths, Aerodynamic heating, Control, Guidance.

The feasibility of recovering a guidance system test vehicle from a single-stage boosted flight using XM-33 and XM-12 boosters is investigated and established. A recovery method is proposed using a variable area drag brake, a parachute system, and aerial snatch by helicopter. Attitude stabilization of the payload during the entire flight is provided by a hot gas reaction control system in conjunction with the guidance system used during the boost phase. Preliminary designs for the necessary subsystems and for the over-all payload and recovery vehicle have been completed and the associated weights and volumes have been estimated. (Author)

AD-255 789 Div. 12, 27
(10 May 61) OTS price $1.10

Science and Tech. Section, Air Information Div. Washington, D. C.
POSSIBLE SOVIET LAUNCHING SYSTEM FOR PRESENT-DAY SATELLITES.
12 Apr 61, 7p. incl. illus. (Trans. from Artificial Earth Satellites; Akademiya Nauk SSSR. Stantsii v Kosmose; Sbornik Statey (Stations in Space; Collection of Articles) Moskva: 27-29, 1960; Upravlyayemyye Snaryady (Guided Missiles). Moskva, Oborongiz, p. 137, 1956; Architecture in Space; Tekhnika Molodezhi 12:16-19, Dec 57)
(AID rept. 61-47) Unclassified report

DESCRIPTORS: *Satellite vehicles, *Satellite vehicle trajectories, *Launching, Orbital flight paths, USSR, Rocket propulsion, Solid rocket propellants, Liquid rocket propellants.

Articles concerning Soviet satellite launching systems are analyzed. The low speed (2 km/sec) during the vertical ascent of the satellite and the acceleration of the satellite in the hori-

zontal direction at a low altitude (30 km) indicate that fuel consumption in this launching system is lower than that required for a launching program in which the satellite is accelerated after reaching high altitude. In the opinion of the analyst, the satellite nose cone is not overheated by the atmosphere during its acceleration to 30 km, because the acceleration period is relatively short and 90% of the atmosphere is located near the earth's surface in a 10- to 15-km thick layer.

AD-255 790 Div. 12, 1
(10 May 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
THE NEXT SOVIET SPACE VEHICLE.
10 Apr 61, 3p. (Trans. from Before the Flight of Man into Space; Ekonomicheskaya Gazeta 3, 26 Mar 61; Biology and Space; Izvestiya 4, 28 Mar 61; Man and Space; Pravda 6, 26 Mar 61 and 4, 27 Mar 61; Daring Project - Brilliant Realization. Press Conference at the Academy of Sciences on the Launching of the Fourth and Fifth Ship-Satellites; Izvestiya 4, 29 Mar 61; TASS report on Launching of the Fifth Ship-Satellite; Pravda 1, 26 Mar 61)
(AID Rept. 61-48) Unclassified report

DESCRIPTORS: USSR, *Spaceships, Manned, *Space flight.

AD-255 793 Div. 12, 9, 27
(10 May 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
DECELERATION OF SPACE VEHICLES.
18 Apr 61, 2p. (Trans. from Meteor-Rocket; Tekhnika-Molodezhi 1, p. 37, 1961)
(AID rept. 61-51) Unclassified report

DESCRIPTORS: Hypervelocity vehicles, USSR, Spaceships, Deceleration, *Meteors, Gas flow, *Re-entry aerodynamics, Bodies of revolution, *Re-entry vehicles, Rocket motors, Plasma physics, Electric discharges, Moments, Theory, Dielectric properties, Gas ionization, *Rockets, Space flight, Technological intelligence.

The electric charge on the nose of a rapidly flying body changes the intensity of the body's deceleration. The use of this effect in the development of a deceleration engine for space vehicles is discussed. In explaining the possibility of using the kinetic energy of a space body for deceleration, the reentry processes for both electrically conductive meteors and dielectric meteors are described.

AD-255 798 Div. 12
(10 May 61) OTS price $1.10.

Science and Tech. Section, Air Information Div., Washington, D. C.
TESTING OF ENGINES FOR FUTURE SPACE VEHICLES.
1 May 61, 4p. (Trans. from At the Cradle of the Starships. Report from Test Site for Space-Vehicle Engines; Komsomol'skaya Pravda 1: 19 Mar 61)
(AID rept. 61-56) Unclassified report

DESCRIPTORS: Technological intelligence, USSR, Test facilities, Spaceships, *Propulsion, Satellite vehicles, Tests, *Ion rockets, Space flight.

A test station where new types of engines for space vehicles are tested is described. The correspondent, Ya. Golovanov, remarks that he had already witnessed the testing of a number of other machines, including turbines and ship engines. This was his first visit, however, to a test station for space-vehicle engines. A description is given of the test station from the point of view of an astonished observer who watched these unusual tests and listened to explanations by a station engineer. Information taken from his description which may be significant is presented. (Author)

AD-255 958 Div. 12, 15
(15 May 61) OTS price $1.10

Naval Ordnance Test Station, China Lake, Calif.
A QUICK METHOD FOR GRAPHICAL PREDICTION OF SATELLITE POSITION,
by C. L. Evans, Jr. 15 Jan 61, 9p. incl. illus. tables (NOTS TP 2607)
(NAVWEPS Rept. no. 7610) Unclassified report

DESCRIPTORS: *Satellite vehicles, Position finding, Mathematical prediction, Determination, Satellite vehicle trajectories, *Orbital flight paths, *Numerical methods and procedures.

A technique was developed for using equator-crossing ephemerides to make specific station satellite predictions. This is done with the help of a gnomonic projection map and a satellite coordinate conversion grid. The predictions made by this method are of sufficient accuracy for most optical and radio tracking purposes. (Author)

13. INSTALLATIONS AND CONSTRUCTION

AD-255 054 Div. 13, 25
(2 May 61) OTS price $8.60

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
THEORETICAL STUDY OF THE DISPLACEMENT OF LONG FOOTINGS BY DYNAMIC LOADS,
by W. L. Wallace. Mar 61, 1v. incl. illus. tables (Miscellaneous paper no. 3-418)
Unclassified report

DESCRIPTORS: *Structures, Rupture, Soils, *Underground structures, Mechanics, Theory, Failure (Mechanics), *Dynamics, *Blast, Explosion damage, Explosions, Shock waves, Mathematical analysis, *Civil engineering, *Nuclear explosions, *Impact shock.

Mathematical procedures are developed for computation of large displacements of long footings subjected to dynamic loads, assuming ultimate failure and a punching-type failure surface. The expressions are presented in a manner convenient for computation of displacement under initial-peak triangular load pulses. Since the work is based on rather broad assumptions and is not substantiated by experimentation, the expressions

should be regarded as a research vehicle rather than a design method for dynamically loaded foundations. Predictions of footing displacement are compared for assumed rotational- and punching-type failures. The displacements associated with punching failure were found to be larger, primarily because of the shorter natural period of that failure mode. For both types of failure, approximations were such that computed displacements should be theoretically less than the true displacements. It is concluded that the punching failure is a better approximation of the true failure conditions. (Author)

AD-255 092 Div. 13
(2 May 61) OTS price $8.60

Illinois U., Urbana.
ANALYTICAL STUDY OF DYNAMIC BEARING CAPACITY OF FOUNDATIONS,
by George E. Triandafilidis. Jan 61, 83p. incl. illus. tables, 16 refs. (Civil engineering studies soil mechanics series no. 4)
(Contract DA 22-079-eng-240)
(DASA-1189) Unclassified report

DESCRIPTORS: *Civil engineering, Design, *Soils, *Mechanics, Mechanical properties, Structures, Underground structures, Motion, Mathematical analysis, Differential equations, Moments, Theory, Load distribution.

An analytical study was undertaken to develop a general approach for the bearing capacity of foundations subjected to time dependent transient loads. This phase of the investigation has been restricted to cohesive soils. The approach is based on a number of simplifying assumptions which provide an expedient way of calculating the resulting angular rotations as functions of time. Solutions have been developed to permit the designer to readily calculate the maximum angular rotations provided the relation between time and the intensity of the dynamic pulse can be expressed by means of a simple mathematical relation. The resulting differential equation of motion has been evaluated for both an initially peaked triangular pulse and a rectangular pulse. (Author)

AD-255 270 Div. 13, 26, 31
(4 May 61) OTS price $1.60

Battelle Memorial Inst., Columbus, Ohio.
THE DEVELOPMENT OF ADVANCE-BASE THERMOCOMPRESSION SEA-WATER STILLS,
by D. L. Hyatt, F. W. Fink, and J. A. Eibling. Quarterly progress rept. no. 12, 1 Dec 56-28 Feb 57. 28 Feb 57, 10p. incl. illus. tables.
(Contract NOy-73219)
Unclassified report

DESCRIPTORS: *Distilling plants, Corrosion, *Sea water, *Water supplies, Water, Condensation, Evaporation, Heat transfer, Heat exchangers, Steam, Plastic coatings, Pipes, Test methods, Tests, Copper alloys, Metals, Nickel alloys, Titanium, Convection.

The results of experiments with dropwise condensation and forced-convection evaporation are presented in curve form. The results cover a range of over-all temperature differences between condensing steam and evaporating water of 2 to 18 F with forced convection flow velocities of 3, 6, and 10 fps. Dropwise condensation was promoted on the evaporator tubes with a Teflon film approximately one-half mil thick. Teflon has a particularly desirable feature in this application in that it presents a permanent dropwise promoting surface. A section of the report presents a summary of material obtained in a survey of the corrosion resistance of commercially available alloys that might be used in the fabrication of thermocompression stills. Based on present knowledge and experience, a 70-30 cupro-nickel alloy is recommended for the tubes in the evaporator and in the several heat exchangers of a still. The suggestion is made of the long-range possibility of using solid Ti or Ti-coated tubes for evaporators. Ti is essentially immune to attack by sea water. (Author)

AD-255 271 Div. 13, 26, 31
(4 May 61) OTS price $1.60

Battelle Memorial Inst., Columbus, Ohio.
THE DEVELOPMENT OF ADVANCE-BASE THERMOCOMPRESSION SEA-WATER STILLS,
by D. L. Hyatt and J. A. Eibling. Quarterly progress rept. no. 11, 1 Sep-30 Nov 56. 30 Nov 56, 10p. incl. illus.
(Contract NOy-73219)
Unclassified report

DESCRIPTORS: *Distilling plants, Convection, *Sea water, *Water supplies, Evaporation, *Water, Condensation, Heat transfer, Films, Heat exchangers, Pipes, Scale, Inhibition, Citric acid, Design, Tests, Steam.

Tests were conducted to determine the degree of improvement in heat transfer that can be obtained with forced-circulation of the evaporating water. The experimentally obtained data have been used to compute over-all heat-transfer coefficients and also film coefficients on both the condensing and evaporating sides of the tubes. Such data are needed to establish the optimum operating conditions for the evaporator of a thermocompression still and also to furnish design parameters for construction of an improved evaporator. A section of the report is devoted to a general discussion of heat transfer in evaporators with particular reference to the thermal resistances of the condensing and evaporating films and of the tube wall and scale deposits. (Author)

AD-255 272 Div. 13, 26, 31
(4 May 61) OTS price $3.60

Battelle Memorial Inst., Columbus, Ohio.
THE DEVELOPMENT OF EVAPORATORS FOR ADVANCE-BASE THERMOCOMPRESSION SEA-WATER STILLS,
by D. L. Hyatt and J. A. Eibling. Summary rept. 15 Nov 55-15 Mar 57. 15 Mar 57, 32p. incl. illus. tables.
(Contract NOy-73219)
Unclassified report

DESCRIPTORS: *Distilling plants, Condensation, *Sea water, *Water supplies, Evaporation, Water, Heat transfer, Heat exchangers, Pipes, Plastic coatings, Corrosion, Convection, Drops, Tests, Test methods, Design, Metals, Copper alloys, Nickel alloys, Steam.

The results of over 100 heat-transfer tests are presented graphically. The tests covered a range of temperature differences between condensing steam and evaporating water of 2 to 18 F, with evaporating water velocities ranging from 0.65 to 10 fps in both film and dropwise condensation. Vertical brass tubes were used; in the dropwise condensations, the tubes were coated with a Teflon film. Results of the forced convection tests showed that the over-all heat-

transfer rate can be doubled by increasing the velocity of the evaporating water from 3 to 10 fps. Two evaporator designs for a 90-gph still are presented; the first would effect a 23% improvement in performance over the best known previous design, with a 10% increase in heat-transfer surface. The second design would yield a performance factor equal to that of the best known previous design, with 20% less heat transfer surface. Only dropwise condensation heat transfer methods would be used for both designs. The gains in heat transfer resulting from forced circulation are offset by the additional power requirements.

AD-255 373 Div. 13
(4 May 61) OTS price $1.10.

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CONSTRUCTION OF A COMPLICATED FOUNDATION UNDER A HEAVY PRESS (Vozvedeniye Slozhnogo Fundamenta Pod Tyazhelyy Press)
by L. V. Milideyev. 18 Oct 60, 4p. (Trans. no. MCL-352 from Novaya Tekhnika Montazhnykh I Spetsialnykh Rabot V Stroitelstve (New Technology of Assembling and Special Operations in Construction) 4:19-21, 1959)
Unclassified report

DESCRIPTORS: *Foundations (Structures), Rods, Construction, *Reinforced concrete, Steel, Reinforcing steel, Reinforcing materials, USSR, Concrete mixers, Earth moving equipment, Hoists, Welding, Concrete, Pipes, Underground structures.

The construction of a reinforced concrete foundation for a 25,000-ton press is described. Some 8198 cu m of concrete and 985 tons of steel were used in the foundation which is 17.7-m high and rests on a base 4 x 25 x 40 m. About 80,000 cu m of earth were removed from close proximity to existing building foundations. The entire operation was highly mechanized and carried out on a round-the-clock basis. The work schedule required 400 cu m of concrete to be poured during 24 hr while 600 cu m/24 hr was attained.

AD-255 390 Div. 13, 14
(4 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
UNUSUAL GIRDER,
by V. Golovinskiy. 2 Nov 60, 2p. (Trans. no. MCL-503 from Znaniye-Sila 10:pp. 29, 1959)
Unclassified report

DESCRIPTORS: *Girders, Materials, Adhesives, Pipes, Plywood, Wood, Structures, USSR, Construction.

A unique girder is being developed from birch and older lumber which is 3 times lighter than a steel girder and 10 times lighter than a ferro-concrete girder. The girder is assembled from pipes which are glued from the veneer. Calculations and experiments demonstrated that the new girder withstands the same loads as the other girders; the spans of the first specimens constitute 12 to 18 meters. A special chemical treatment insures their fire-, moisture-, and bacteria-resistance.

AD-255 422 Div. 13
(8 May 61) OTS price $7.60

Army Engineer Research and Development Labs., Fort Belvoir, Va.
TEMPERATE CLIMATE AND COLD TEMPERATURE CHAMBER TESTS OF THE GENERATOR, FOAM, TRAILER-MOUNTED, 2-WHEEL, WITH FOAM-LIQUID STORAGE TANK, 300-GALLON CAPACITY,
by John F. Christian. 2 Dec 60, 68p. incl. illus. (Technical rept. no. 1660-TR)
(Proj. 8-76-05-400)
Unclassified report

DESCRIPTORS: Tests, *Trailers, Military requirements, *Firefighting vehicles, *Fire extinguishers, Fire pumps, Storage tanks, Fuel storage tanks, Human engineering, Foams, Storage tanks, Climatic factors, Temperature.

Results are presented of the temperate climate and cold chamber engineering tests of a trailer-mounted foam generator. The unit is intended for use with mechanical foam liquids designed for mixture with water at 3 or 6% solution concentration to provide fuel tank storage fire protection in connection with accessory fire fighting equipment. Other than for supply of water, the unit is self-contained but not self-propelled. It was concluded that the unit will satisfy military requirements after certain modifications are made. (Author)

AD-255 492 Div. 13
(7 May 61) OTS price $4.60

Hostrup, Lyons, and Associates, Los Angeles, Calif.
STUDY OF MECHANICAL ENGINEERING FEATURES OF POLAR WATER SUPPLY.
Quarterly progress rept. no. 1, 1 July 52. 9p. tables.
(Contract NOy-27491)
Unclassified report

DESCRIPTORS: *Water supplies, Arctic regions, Mechanical engineering, Chemical analysis, Water, Physical properties, Alaska, Canada, Purification, Sanitary engineering.

Surface waters of the northwest Canadian Arctic and northern and central Alaska differ from those usually selected as water supplies in the continental United States by only one feature, that is, the possession of rather high pH values. This fact, together with the low temperatures of such waters, tends to reduce the efficiency of disinfection procedures using chlorine and its compounds, and presumably most other disinfecting agents that might be employed. Considerable silt may be present in the larger Arctic rivers during the warm months, necessitating coagulation and filtration if they are to be used as water supplies. Ground waters of the northwest Canadian Arctic are rather unsatisfactory as water supplies; those of northern Alaska appear to be somewhat better but not entirely satisfactory in all cases. Both the ground and surface waters of the Eastern Canadian region exhibit no features that distinguish them from, say, those of the Eastern United States and appear to offer no special difficulties with respect to treatment for water supply purposes. (Author)

AD-255 493 Div. 13
(7 May 61) OTS price $4.60

Hostrup, Lyons, and Associates, Los Angeles, Calif.
STUDY OF MECHANICAL ENGINEERING FEATURES OF

POLAR WATER SUPPLY.
Quarterly progress rept. no. 2, 1 Oct 52. 37p.
(Contract NOy-27491)

Unclassified report

DESCRIPTORS: *Water supplies, Arctic regions, Mechanical engineering, Water, Purification, Chemical analysis, Physical properties, Alaska, Canada, Sanitary engineering, Water filters, Water softeners, Algae, Growth, Permafrost.

Contents:
Orthodox treatment cycles
Screening
Weeds and other growths - Control
Control of birds
Control of algae
Aeration
Sedimentation and coagulation
Filtration
Filter piping and valves
Rate of flow controllers
Chlorination
Water softening
Fluorine control
Iron and manganese removal
General arrangement of a plant
Typical wells in permafrost areas
Piping - non permafrost areas
Influence of polar conditions on treatment practice
Bacteriological conditions of polar waters
Air and water temperatures
Mixing of chemicals
Sedimentation
Chemical storage
Slow sand filtration
Rapid sand and diatomaceous earth filtration
Water softening

AD-255 494 Div. 13
(7 May 61) OTS price $2.60

Hostrup, Lyons, and Associates, Los Angeles, Calif.
STUDY OF MECHANICAL ENGINEERING FEATURES OF POLAR WATER SUPPLY.
Quarterly progress rept, no. 3, 1 June 53. 25p. 105 refs.
(Contract NOy-27491)

Unclassified report

DESCRIPTORS: *Water supplies, Arctic regions, Mechanical engineering, Water, Heating, Heaters, Alaska, Canada, Purification, Sanitary engineering, Construction, Ecology, Permafrost.

Contents:
Methods and equipment for space heating
Permafrost and foundation treatment
Indication of permafrost
Construction methods
Per capita requirements
Water sources

AD-255 708 Div. 13
(9 May 61) OTS price $7.60

Massachusetts Inst. of Tech., Cambridge.
PORE PRESSURE MEASUREMENTS DURING TRANSIENT LOADINGS,
by Kent A. Healy. Rept. no. 5 on The Response of Soils to Dynamic Loadings. Nov 60, 29p. illus.
(Contract DA 22-079-eng-224)
(DASA-1205) Unclassified report

DESCRIPTORS: *Soils, Pressure, Measurement, Porosity, *Civil engineering, Trafficability.

This report consists of (1) a general discussion of the problems involved in pore pressure measurements during transient loadings, (2) a description of the conventional pore pressure measuring systems and their inadequacies, (3) descriptions of the design and preliminary testing of a new system for pore pressure measurement using a PT 25 Dynisco pressure transducer, (4) a detailed presentation of data obtained in tests in which the new pore pressure measuring system was employed, and (4) a discussion of results of the testing and the implications of these results. The feasibility of employing the new pore pressure measuring system in rapid testing has been demonstrated by the following tests: (a) one-dimensional tests on fat clay and silty loam, (b) triaxial tests on a saturated clayey-silt, and (c) triaxial tests on a fat clay. (Author)

14. MATERIALS (NON-METALLIC)

AD-255 079 Div. 14, 25
(3 May 61) OTS price $1.10

Systems Research Labs., Inc., Dayton, Ohio.
THE ELECTRICAL BEHAVIOR OF REFRACTORY OXIDES,
by Robert W. Vest. Bi-monthly progress rept. 21 Mar 61, 8p. incl. illus. (Rept. no. 203)
(Contract AF 33(616)7748)

Unclassified report

DESCRIPTORS: Ceramic materials, *Refractory materials, *Zirconium compounds, Oxides, Electrical properties, Conductivity, Vacuum furnaces, Thermoelectricity, Dielectric properties, Crystals, Preparation, Dioxides, Thermocouples, Polarization, Measurement, Electrical conductance, Single crystals, Sapphires.

A study was begun on the electrical properties of refractory oxides. Initial measurements to be made on single crystals and polycrystalline ZrO2 will include electrical conductivity, thermoelectric power, dielectric constant, and polarization voltages. A hot press is being designed for operation in vacuum or an inert atmosphere at 2000 C and 4000 psi. By replacing the die with a W susceptor, the unit can be converted to a high-temperature vacuum furnace. Preliminary studies were made of the preparation of dense ZrO2 by hydrostatic pressing (4000 to 17,000 psi) and sintering in vacuum at 1800 to 1950 C. An attempt will be made to grow single crystals from the vapor phase of the reaction between ZrCl4 and oxygen near 1000 C. Details are presented of an experimental apparatus for the measurement of electrical conductivity, dielectric constant, and thermoelectric power. Fast and slow polarization voltage measurements will be made initially on single crystal sapphire with the apparatus for conductivity measurements.

AD-255 136 Div. 14, 27, 31
(2 May 61) OTS price $2.60

Naval Boiler and Turbine Lab., Philadelphia, Pa.
DETERMINATION OF WATER REMOVABILITY OF RUST PREVENTIVE COMPOUNDS,
by J. A. McKelvey. 15 Mar 61, 9p. illus. tables. (Proj. A-331)

Unclassified report

DESCRIPTORS: *Corrosion inhibition, Pipes, *Coatings, *Boilers, Boiler tubes, Steam, Steam pipes, Water, Heat, Steam turbines, Ships, Cleaning, Storage, Solvent action, Metals.

None of the preservatives evaluated were completely removed by either hot water or low pressure steam. Dynamic low pressure steam was the most effective means of removal; hot water was slightly less effective; and static steam was the least effective. Preservatives with the highest percent removal were Cosmoline 1091, NS 3763, and Tectyl 5-11M. Preservatives with the lowest percent removal were Cosmoline 1046, Gulf No Rust D, and Cosmoline 1091 cutback 1:1 preservative-to-solvent ratio using static steam. Evaluating preservative removability on the more realistic, weight per unit area of preservative remaining on tube surfaces, showed that, generally, Tectyl 5-11M and Tectyl 848 were the preservatives with the least amounts remaining after the various treatments. In most cases Gulf No rust D and NOKORODE had the largest amounts remaining. Inadequate corrosion protection was afforded by 3 compounds that had been solvent cutback at a 1:1 ratio; corrosion was found under the preserved surface of the tubes. The 3 compounds were NS-3673, Cosmoline 1091 and Nox-Rust 208. (Author)

AD-255 207 Div. 14, 17, 22
(3 May 61) OTS Price $4.60

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
DEVELOPMENT OF ANTI-SEIZE COMPOUND FOR TANK APPLICATION,
by Robert A. Erb. Final rept. on Phase 2, 26 Nov 58-25 Nov 60. 25 Nov 60, 1v. incl. illus. tables. (Rept. no. F-A2242)
(Contract DA 36-034-ORD-2808)

Unclassified report

DESCRIPTORS: *Corrosion inhibition, Tanks, Physical properties, Corrosion research, *Antiseize compounds, Acrylic resins, Zinc pigments, Chromates, Fluorides, Ethanes, Effectiveness.

The program for the continued development of the acrylic resin-tetrafluoroethylene-basic zinc chromate type anti-seize compound is described. Various experimental studies were undertaken including those of dispersion techniques; corrosion resisting properties, adhesion, suspension stability, brushmark flow-out, and other properties; application studies with dry-times and force-fit conditions. Samples of two different base compositions were submitted for field tests. As a result of the experimental program and field tests a modified FIL 92-46-1 composition (low acrylic resin content) is recommended for use. (Author)

AD-255 283 Div. 14, 3, 13, 26
(4 May 61) OTS Price $2.60

Institute of Paper Chemistry, Appleton, Wis.
DEVELOPMENT OF AN IMPROVED DIFFUSION BOARD MATERIAL,
by L. Leporte and T. A. Howells. Monthly progress rept. no. 6, 1-28 Mar 61. 24 Apr 61, 18p. incl. tables.
(Contracts DA 18-108-405-cml-941 and DA 18-108-cml-6561, Proj. 2256)

Unclassified report

DESCRIPTORS: *Fiberboard, Insulating materials, Shelters, Wood pulp, Charcoal, Additives, Production, Test methods, Chemical warfare agents, Aerosols, Diffusion, Penetration, Deterioration, Gases, Moisture proofing, Mildew, Fungicides.

Gas life tests on boards made at a range of pH values showed a significant loss of CK life between pH 7.5 and 6.2 and almost complete loss when pH was dropped to 5.2, indicating necessity of forming boards under alkaline conditions. Water resistance was tested by an immersion method which showed that washing of the available M & O pulp, although adequate to increase gas life, was not sufficient to remove residual sizing. Aquapel, used under various conditions, reduced water absorption to approximately 6%, but first gas life tests showed some loss. Testing of mildew resistance by direct inoculation of a nonsterile specimen was initiated. Boards made previously with acidified Dowicide G had poor gas life; boards made with tributyl tin oxide showed erratic but more encouraging gas life. Evaluation of other fungicides was started. (Author)

AD-255 369 Div. 14
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
LUBRICANTS, THEIR ADMIXTURES AND PARAFFINS (SELECTED ARTICLES).
Nov 60, 16p. incl. tables (Trans. no. MCL-327 from Smazochnyye Materialy, Prisadki k Nim i Parafiny, (Trudy no. 7)pp. 403-408, 409-413, 1958).

Unclassified report

DESCRIPTORS: *Lubricants, Mixtures, USSR, Materials, *Molybdenum compounds, Sulfides, *Silicon compounds, Liquids, Stability, Temperature, Ultrasonics, Antioxidants, Solids, Thin films, *Antiseize compounds.

MOLYBDENUM DISULFIDE--A NEW LUBRICANT: The problem of applying the solid lubricant MoS2 which requires a high degree of dispersion was studied. Mechanical (jet mill) and physical (ultrasonic) dispersion methods were used. Aggregation of the particles was avoided by conducting the grinding process in a liquid medium. MoS2 films were capable of withstanding heavy loads acting for a short time. THE INCREASE OF THE THERMAL STABILITY OF Si LIQUIDS BY MEANS OF ULTRASONICS AND ANTIOXIDATION ADDITIONS: The thermal stability of irradiated Si liquids was studied by the kinetics of changes in kinematic viscosity and the gelatinization time of a liquid exposed to ultrasonics as a function of the time of thermostatic regulation of a certain layer of the tested product. In the production of the lubricant tsiatim -221 (Si liquid, thickened by calcium stearate), the optimum irradiation time of 4 min for obtaining the best thermostability approximately corresponds to the optimum for obtaining the proper colloidal stability (2 to 10 min). The addition of an antioxidation admixture to the irradiated liquid increased thermostability.

AD-255 545 Div. 14, 4
(10 May 61) OTS price $3.60

Buffalo U., N. Y.
THE DEVELOPMENT OF CHEMICALLY RESISTANCT RUBBERS FROM SEMI-ORGANICS FOR USE AT EXTREME LOW TEMPERATURES,
Research rept. 22 Aug 58-1 Feb 61. 1 Feb 61, 35p. incl. illus. 11 refs.
(Contract DA 19-129-qm-1271)
Unclassified report.

DESCRIPTORS: *Elastomers, *Polymers, *Metalorganic compounds, *Synthetic rubber, Low temperature research, Synthesis, *Silicones, Dienes, Vinyl radicals, Titanium compounds, Polymerization, Chlorides, Chemical reactions, Monocyclic compounds.

Although some new compounds have been prepared the preparation of bis(vinylcyclopentadienyl)titanium dichloride was unsuccessful. Some copolymers of silicon and titanium have been prepared, but none has been found which is in any way superior to those already developed by other methods. The only substituted bis(cyclopentadienyl)titanium dichloride which could be prepared was the allyl derivative, and definite proof of this compound's identity is lacking. The conclusion was reached that the only possible preparation of a bis(cyclopentadienyl)titanium dichloride derivative containing substituents on the cyclopentadiene ring lies in the preparation of the corresponding cyclopentadiene and then the subsequent reaction of its sodium derivative with titanium tetrachloride. (Author)

AD-255 639 Div. 14, 12, 30
(17 May 61) OTS price $1.10

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind.
SERVICES TO GENERATE BASIC ENGINEERING DATA ON THE BEHAVIOR OF PLASTIC COMPOSITE STRUCTURES UNDER VARIOUS CONDITIONS OF STRESS,
by F. P. Wildy. Monthly progress rept. no. 2, 1-30 Apr 61, on Rocket Propulsion Equipment Engineering. 30 Apr 61, 7p. incl. illus. tables.
(Contract NOw 61-0488-c)
Unclassified report

DESCRIPTORS: *Plastics, *Resins, Insulating tapes, Insulating materials, Glass textiles, Structures, Test equipment, Test methods, Tests, *Pressure vessels.

Test methods and results of D-ring tests on prepreg tapes made from yarn and pre-preg 20-end rovings are summarized. The test fixture is the NOL-type split ring test. The test procedure consists of wrapping a pre-preg tape around the outer periphery of a short cylinder divided into 2 equal sections, each resembling the letter D. After winding, the ring assembly and tape are placed in a curing oven; after curing the unit is placed in the tensile test machine. During the test the ring is subjected to both tension and bending. Determination of per cent resin content of the specimen and cross sectional area of glass being tested is arrived at by a burn-off test.

AD-255 679 Div. 14, 30
(10 May 61) OTS price $2.60

Forest Products Lab., Madison, Wis.
EFFECT OF INFRARED HEAT ON 45 DEGREE TENSILE STRENGTH OF TWO REINFORCED PHENOLIC LAMINATES,
by Kenneth H. Boller. Mar 61, 18p. incl. illus. tables (Rept. no. 1879)
(Contract NAer-01967)
Unclassified report

DESCRIPTORS: *Infrared radiation, *Thermal radiation, Thermal stresses, Mechanical properties, Heating, Failure (Mechanics), Fracture (Mechanics), Tensile properties, *Phenolic resins, *Laminates, Glass textiles, Asbestos fiber, Reinforcing materials, Test methods, Test equipment, Plastics, Resins.

An investigation was made of the effect of air-transmitted heat energy versus radiated heat energy on the strength of reinforced plastic laminates. The study was conducted on tensile coupons from phenolic laminates made with either glass fabric or asbestos fibers and machined at 45 degrees to the natural axes. The results of the first series, in which the temperature of the coupons was increased on the surface at a constant rate before loading, show the characteristic drop in strength with increases in temperature from air heating and a slightly greater drop in strength with IR heating. The results of the second series in which the coupons were partially loaded and then heated with IR on one side from 1 to 29 F/sec until failure occurred, showed that the hot-side temperature increased with increasing rate of temperature rise; furthermore the center temperature (average of hot and cold side) was relatively unaffected by rate of temperature rise. (Author)

AD-255 699 Div. 14, 6, 25
(9 May 61) OTS price $2.60

Institute of Science and Tech., U. of Michigan, Ann Arbor.
OPTICAL MATERIALS FOR INFRARED INSTRUMENTATION,
by Stanley S. Ballard, Kathryn A. McCarthy, and William L. Wolfe. IRIA State-of-the-Art rept. Apr 61, 21p. incl. illus. tables (Rept. no. 2389-11-S1, Suppl. to rept. no. 2389-11-S, AD-217 367)
(Contract Nonr-122412)
Unclassified report

DESCRIPTORS: *Infrared optical materials, Instrumentation, *Optical materials, Optical instruments, Refractive index, Optical glass, Crystals, Ceramic materials, Optics, Infrared equipment, Physical properties, Electrical properties, Mechanical properties, Materials.

Additional data are compiled on the optical materials, which are useful for infrared instrumentation, treated in 2389-11-S, as well as data on three new materials, Irtran-1, Irtran-2, and diamond. In addition, several errors and ambiguities in the original report are corrected and clarified. (Author)

AD-255 742 Div. 14, 1
(10 May 61) OTS price $2.60

Snell, Foster, Inc., New York.
RAIN REPELLENT,
by R. Blaufox, E. McDonnell, and J. Mitchell Fain. Quarterly interim rept. no. 1, 1 Jan-31 Mar 61. 10 Apr 61, 27p. incl. illus.
(Contract NOw 61-0463-c; Continuation of Contract NOa(s) 60-6029-c)
Unclassified report

DESCRIPTORS: *Moisture proofing, *Films, Resins, Plastic coatings, *Silicones, *Silanes, Oils, Fluorides, Methyl radicals, Halides, Windshield, Aircraft, Ignition, Jet engine fuels, Raindrops, Acids, Glass, *Coatings, Test equipment, Test methods, Thin films.

Acidification of dimethyl silicone oils re-

sulted in a material which gave films having a life on the rain spray machine in excess of one hour and which were not affected by the action of jet fuel oil. A product of increased flash point was obtained. An experimental fluorosilicone fluid which has recently become available, was studied for its value as a rain repellent. Acidification with both sulfuric acid and p-toluene sulfonic acids did not produce a material having a life on the rain spray machine equal to that of similarly treated dimethyldiethoxysilane or dimethyl polysiloxane. (Author)

AD-255 758 Div. 14, 17, 25
(12 May 61) OTS price $3.60

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
THE VAPORIZATION AND PHYSICAL PROPERTIES OF CERTAIN REFRACTORIES,
by A. A. Hasapis, A. J. Melveger and others.
Quarterly technical summary rept. no. 5, 3 May 61, 31p. incl. illus. tables, 17 refs. (Technical rept. no. RAD-SR-61-54, Rev. 1; Supersedes AD-254 225)
(Contract AF 33(616)6840)
(ARPA Order no. 24-60, Task 6)
Unclassified report

DESCRIPTORS: *Refractory materials, Oxides, Vaporization, Physical properties, Silicon, *Ruthenium, *Hafnium compounds, *Rare earths, Thermodynamics, Mass spectrometers, Mass spectroscopy, Chemical reactions, Tungsten, Molybdenum, Mixtures, Tantalum, Boron, Surface tension, Transition elements, Viscosity, Ceramic materials.

VAPORIZATION STUDIES: Preliminary data are presented on Ru. Preliminary vaporization and thermodynamic data are presented for the reactions of: (1) HfO2(s) yielding HfO(g) + O(g); and (2) HfO(g) yielding Hf(g) + O(g). A mass spectrometric survey was made on the mode of vaporization of all the rare earth sesquioxides. Mo-Si and W-Si system data are presented. SURFACE TENSION: A summary is given of surface tension data obtained on Si and Si plus additives. (Author)

AD-255 786 Div. 14, 26
(10 May 61) OTS price $1.10

Science and Tech. Section, Air Information Div. Washington, D. C.
IMPROVEMENT OF MECHANICAL AND THERMOMECHANICAL PROPERTIES OF PLASTICS BY THE USE OF ACTIVE FILLERS.
10 Apr 61, 2p. (Trans. from Filled Polymers. IV. Incorporation of Fillers into Dissolved Polymethylmethacrylate. Vysokomolekulyarnyye Soyedineniya 3:37-40, Jan 61)
(AID rept. 61-44) Unclassified report

DESCRIPTORS: *Plastics, *Resins, Polymers, *Acrylic resins, Methyl radicals, Bentonite, Montmorillonite, Clays, Additives, Mechanical properties, Hardness, Viscosity, Decomposition, Calcite, Reinforcing materials, Manufacturing methods, Heat, USSR, Physical properties.

A method of introducing active fillers, such as bentones, into polymers to improve mechanical and thermomechanical properties is reported. Incorporation of a filler suspended in a solvent into a polymer solution is described. The effect produced by active (i.e., increasing mechanical strength of the polymer by orienting the molecules) and inactive fillers were compared. Hardness testing, thermal analysis, plotting of thermomechanical curves, and other physical tests indicated definite improvement of mechanical and thermomechanical properties of polymethylmethacrylate filled with active fillers. Among other improvements in physical properties, the viscous-flow point and the thermal-decomposition point of specimens were approximately 50 to 20 degrees higher, respectively, than the corresponding points of the unfilled polymer. Polymethylmethacrylate filled with chalk displayed some degradation in physical properties. (Author)

AD-255 808 Div. 14
(11 May 61) OTS price $1.60

Carborundum Co., Niagara Falls, N. Y.
DEVELOPMENT OF ULTRA REFRACTORY MATERIALS,
by Peter T. B. Shaffer. Progress rept. no. 24, 1 Feb-30 Apr 61. 28 Apr 61, 8p. incl. illus. tables.
(Contract NOrd-17175)
Unclassified report

DESCRIPTORS: *Refractory materials, Melting, *Carbides, Zirconium compounds, Temperature, Tantalum compounds, Measurement, Lattices, Phase studies, Mechanical properties, Electrical properties, Heat treatment.

Fundamental studies of the properties of solid solutions of ZrC and TaC were continued in an effort to explain certain anomalies such as the increased melting temperature and increased high temperature (above 3630 F) strength and creep resistance. It was decided to remeasure the melting temperatures. The melting point apparatus was checked for reproducibility of results by fusing several samples of refractory metal sheets, W, Ta, Mo, and Nb. The degree of precision and reproducibility of data indicated that sufficient accuracy should be obtainable in the melting point study of the ZrC-TaC system. Preliminary results were obtained on carbide bars heated directly by resistance. Apparent melting temperatures were measured on the bars up to the appearance of first droplets of liquid. A complete series of compositions is being prepared for melting temperature observations.

AD-255 894 Div. 14, 25, 30
(16 May 61) OTS price $2.60

Atomics International, Canoga Park, Calif.
THERMAL PROPERTIES OF REFRACTORY MATERIALS,
by J. A. Cape and R. E. Taylor. Quarterly progress rept. no. 3, 1 Feb-31 Apr 61 on Materials Thermal Properties. 31 Apr 61, 21p. incl. illus. tables.
(Contract AF 33(616)6794, Proj. 4776)
(ARPA Order no. 24-59) Unclassified report

DESCRIPTORS: *Refractory materials, *High temperature research, Carbides, Titanium compounds, Heat transfer, Uranium compounds, Silicides, Specific heat, Thermodynamics, Measurement, Electrical properties, Resistance, Pyrometers, Optical instruments, Radiation pyrometers.

The thermal conductivity of TiC was measured over the temperature region 400 to 1200 C by the steady state radial heat flow method. The conductivity varies linearly from 0.088 cal/sec cm degree C at 500 C to 0.109 cal/sec cm degree C at 1100 C. These results are in marked contrast to values reported in the literature. The techniques and apparatus for measuring the specific heat of brittle conductors by pulse heating

are described. Resistivity and specific heat data for uranium silicide of several compositions are reported. The resistivity and specific heat increased with increasing silicon content. For uranium silicide containing 3.8% silicon, the resistivity increased from 56 microhm-cm at 0 C to 75 microhm-cm at 750 C and for uranium silicide containing 5.9% silicon, the resistivity increased from 81 microhm-cm at 0 C to 111 microhm-cm at 800 C. (Author)

AD-255 945 Div. 14, 26
(15 May 61) OTS price $1.60

General Electric Co., Cincinnati, Ohio.
THE EFFECT OF ARC PLASMA DEPOSITION ON THE STABILITY OF NON-METALLIC MATERIALS,
by B. E. Kramer and M. A. Levinstein. Bimonthly rept. no. 6, Jan-Feb 61. 3 Apr 61, 9p. incl. tables (Rept. no. DM 61-94)
(Contract NOa(s) 60-6076-c)
Unclassified report

DESCRIPTORS: *Flame spraying, *Plasma jets, *Refractory materials, *Ceramic materials, Nozzles, Spray nozzles, Oxides, Carbides, Nitrides, Coatings, Refractory coatings, Stability, Aluminum compounds, Zirconium compounds, Chromium compounds, Hafnium compounds, Tantalum compounds, Deposits, X-ray diffraction analysis, Graphite.

All of the materials under study may now be readily deposited as thin coatings onto graphite substrates. Some of the materials, particularly ZrO2 are stressed in the as-sprayed condition, both on a micro scale (lattice strains) and a macro scale because of shrinkage of the individual particles. The carbides and nitrides revealed sharp, intense diffraction lines indicating an absence of lattice strains; this absence does not exclude the possibility of stresses in the coating due to shrinkage of the individual particles. The materials which can be readily built up into thick coatings and which may be used as regularly shaped samples are Al2O3, Cr2O3, and ZrB2 and the carbides. When these materials are sprayed under controlled conditions and the proper gases are used, they are deposited in substantially the same form as the raw material. Minor variations in lattice parameters and stoichiometry should not preclude the use of the materials as sprayed coatings. (Author)

AD-255 965 Div. 14, 25
(15 May 61) OTS price $3.60

Pennsylvania State U., University Park.
DYNAMIC MECHANICAL PROPERTIES OF STRETCHED NATURAL RUBBER,
by Edwin R. Fitzgerald. 1 May 61, 33p. incl. illus. tables, 24 refs. (Technical rept. no. 1)
(Contract Nonr-65626, Proj. NR 384-314)
Unclassified report

DESCRIPTORS: *Rubber, Mechanical properties, *Vulcanizates, Shear stresses, Measurement, Crystal structure, Elasticity, Phase studies, Phase transitions, X-ray diffraction analysis, Crystallization.

Dynamic shear compliance measurements on a vulcanized natural rubber stock have been carried out from 50 to 5000 c as a function of static elongation in the range 0-400%. Above 300% elongation several very large resonance dispersions appear in the region 1000-2000 c, but at lower elongations no such resonances are observed. The appearance of mechanical resonance dispersion coincides with the development of oriented crystallinity in the stretched rubber as shown from X-ray diffraction data. The magnitudes of the dispersions decrease with increasing elongation above 300% whereas X-ray measurements indicate the amount or extent of crystallinity increases with stretching above 300% elongation. The resonances clearly decrease as the crystallinity becomes more perfect or more extensive and appear to reflect the imperfections of the crystalline regions formed by elongation rather than the crystallinity itself. Observed changes in the compliance spectrum with time at each elongation also favor this view. (Author)

AD-255 980 Div. 14, 1, 4
(15 May 61) OTS price $7.60

Midwest Research Inst., Kansas City, Mo.
DEVELOPMENT AND EVALUATION OF HIGH-TEMPERATURE RESISTANT COMPOSITE PLASTIC PLATES.
Final rept. 15 Dec 59-14 Feb 61. 28 Feb 61, 69p. incl. illus. tables.
(Contract NOa(s) 60-6099-c)
Unclassified report

DESCRIPTORS: *Plastics, *Heat resistant polymers, *Thermosetting resins, *Epoxy resins, *Epoxides, Resins, Laminates, *Aircraft canopies, Tensile properties, Mechanical properties, Materials, Determination, Films, Synthesis, Casting, Polycyclic compounds, Heptanes, Anhydrides, Phthalic acids, Vinyl radicals, Cyclo hexenes, Tests.

The tensile and flexural properties were determined for the resin obtained from the diglycidyl ether of bisphenol A and 6.5 pph of trimethoxyboroxine. The resin has high ultimate flexural and tensile strengths; about 5% of the 76 F flexural strength was retained at 300 F. This cured resin should be usable in three-layer canopies at skin temperatures up to 350 F. Maximum thermal rigidity was obtained from the hexahydrophthalic anhydride - vinylcyclohexene dioxide resins at a ratio of 0.7 to 0.8 mol anhydride per mol equivalent epoxide. This resin should structurally resist skin temperatures up to 450 F in three-layer composite canopies. A film-forming mold release agent was developed for releasing epoxide resins cast in plate glass molds. Castings of epoxide resins made in the coated plate glass molds had excellent optical properties. The syntheses of novel epoxide resins based on two bicyclic (2.2.1) heptane rings with three different types of connecting groups, a carbonate, an ester, and an ether are discussed. (Author)

15. MATHEMATICS

AD-255 064 Div. 15
(2 May 61) OTS price $1.60.

Battelle Memorial Inst., Columbus, Ohio.
THEORETICAL STUDY OF HOMOTOPY THEORY AND DUALITY

FOR MODULES AND SPACES.
Annual technical rept. no. 2, 1 Apr 60-31 Mar 61. 30 Apr 61, 12p.
(Contract DA 91-591-EUC-1436)
Unclassified report

DESCRIPTORS: *Algebraic topology, Theory, Groups (Mathematics), Sequences,

Contents:
Abstract
General homotopy groups of spaces and maps
Algebraic homotopy theory in abelian categories and in general (non-additive) categories
Group-like structures in general categories
Summary and analysis
Topological aspect
Algebraic aspect
Group-like structures
Analysis
Future work
Group-like structures in (non-additive) categories
Cone constructions and semi-simplical methods in general categories
Homotopy and cohomology operations
Administrative information

AD-255 072 Div. 15
(3 May 61) OTS price $11.50

Statistical Lab., Iowa State, U. of Science and Tech., Ames.
DISTRIBUTION THEORY OF SOME ANGULAR VARIATES,
by J. Arthur Greenwood. 13 Apr 59, 144p. incl. tables, 153 refs. (Technical rept. no. 1.13)
(Contract DA 11-022-ORD-2732, Proj. 401-04-17-95-2633)
Unclassified report

DESCRIPTORS: *Distribution theory, Bessel functions, *Statistical distributions, Probability, Fourier analysis, Special functions, Meteorology, Physiology, Geology.

AD-255 234 Div. 15
(3 May 61) OTS Price $5.60

Princeton U., N. J.
THE COST-OF-LIVING INDEX: ALGEBRAICAL THEORY,
by S. N. Afriat. Rept. on Econometric Research Program. 17 Mar 61, 41p. (Research memo. no. 24)
(Sponsored by Office of Naval Research)
Unclassified report

DESCRIPTORS: *Costs, Indexes, *Economics, *Theory, *Economic conditions, Standards, Measurement, *Statistical analysis, *Algebras, Combinatorial analysis.

The cost of living problem has almost entirely been a search for an algebraical formula, involving the expenditure data for the base and object occasions, which could with good reason be considered as an index of the cost-of-living. An index of such a form and with such a justification was never found. All the same, the theory set out in this memorandum can, with a suitable enlargement of ideas, be considered a continuation of that traditional pursuit. The method which is to be adopted for pursuing the problem is to consider all preference systems, of the normal type, that are consistent with the expenditure data for a variety of occasions. A case for the use of the algebraical method is that it is simpler in its calculations, has interpretation in terms of a constructive model, and that it has a further interpretation in terms of the combinatorial method, from which it can be derived, by taking a special form of solution, which is called the median form of solution, of a system of inequalities involved in the combinatorial method. In fact, this median form of solution will be made the genesis of the algebraical method in the context of the inequalities which are the basis for the combinatorial method. Thus, the quadratic property of median solutions is demonstrated, and then made the basis for the algebraical method. (Author)

AD-255 347 Div. 15
(5 May 61) OTS price $7.60

Washington U., Seattle.
THE CONTRIBUTION OF EPPS SCORES TO DIFFERENTIAL AND MULTIPLE ABSOLUTE ACADEMIC PREDICTION,
by Paul Horst. Apr 61, 73p. incl. tables.
(Contract Nonr-47708)
Unclassified report

DESCRIPTORS: *Mathematical prediction, Students, Test methods.

The value of prediction as a scientific aim has been repeatedly emphasized by almost all the scientists not merely as an intellectual exercise but due to its obvious practical utility. In education, military services, industries, or any other place where the emphasis is on best utilization of human resources the problem of prediction enters in. How well a student will do in college or school and in what areas, how well a cadet will do in military services and in which branch, and how well a person will do in various industries are some of the questions which we very often ask of ourselves and of others. The answers to these questions are inherent in the problem of prediction. As most of the fields of employment in our society require a certain level of achievement in various school and college courses, the prediction of academic success is of prime importance. (Author)

AD-255 355 Div. 15
(11 May 61) OTS price $2.60.

Electronics Research Lab., U. of Calif. Berkeley.
TWO THEOREMS CONCERNING REGULAR MARKOV CHAINS,
by G. G. Lendaris. 27 Feb 61, 19p. incl. illus.
(Series no. 60, Issue no. 347)
(Contract AF 18(600)1521)
(AFOSR-480) Unclassified report

DESCRIPTORS: Statistical analysis, Sampling, Matrix algebra, *Mathematics, *Probability,

AD-255 477 Div. 15
(7 May 61) OTS price $1.60.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
SOME INTEGRAL INEQUALITIES FOR UNIFORMLY ELLIPTIC OPERATORS,
by J. H. Bramble and L. E. Payne. Apr 61, 11p.
(Technical note no. BN-239)
(Contract AF 49(638)228)
(AFOSR-556) Unclassified report

DESCRIPTORS: *Partial differential equations, Integral equations, Operators (Mathematics), Inequalities, Functions, Integrals,

Certain inequalities are derived which lead to bounds for solutions of mixed boundary value problems for second order elliptic partial differential equations. (Author)

Division 15 - MATHEMATICS

AD-255 516 Div. 15
(11 May 61) OTS price $1.60

Polytechnic Inst. of Brooklyn, N. Y.
SIMPLE REALIZATIONS OF THE INFINITESIMAL GENERATORS OF THE PROPER ORTHOCHRONOUS INHOMOGENEOUS LORENTZ GROUP FOR MASS ZERO,
by J. S. Lomont and H. E. Moses. 21 Mar 61, 10p. (Technical rept. no. 2)
(Contract Nonr-83930, Proj. NR-013-106)
Unclassified report

DESCRIPTORS: *Groups (Mathematics), Spin, *Operators (Mathematics), Functions, Rotation, Matrix algebra.

A realization of the infinitesimal generators for the mass zero case of the proper orthochronous inhomogeneous Lorentz group is given explicitly for both continuous and discrete spin cases in terms of a uniform rotation. The realization for the discrete spin case is unitarily equivalent to that given by Shirokov. For the sake of completeness the infinitesimal generators for the case of non-zero mass, derived by Foldy, are also given. Hence the present paper contains realizations for all irreducible unitary representations of the inhomogeneous Lorentz group of physical interest. Since the irreducible representations of the two-dimensional Euclidean group play an important role in the massless case, simple realizations of the irreducible representations of the generators of this group are also given. (Author)

AD-255 657 Div. 15
(12 May 61) OTS price $2.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
AN ASYMPTOTIC EXPANSION FOR A CLASS OF MULTIVARIATE NORMAL INTEGRALS,
by Harold Ruben. 2 May 61, 21p. (Technical rept. no. 69)
(Contract Nonr-22552, Proj. NR-342-022)
Unclassified report

DESCRIPTORS: *Statistical analysis, Applied mathematics, Correlation techniques, Statistical distributions, Mathematics, *Series, Integrals.

AD-255 678 Div. 15, 25
(10 May 61) OTS price $1.10

Friedman, Morris D., West Newton, Mass.
SOLUTION OF THE INVERSE DIFFRACTION PROBLEM,
by D. IA. Petrina. Mar 61. 5p. (Trans. no. P-165 from Ukr. Mate. Zh., 12:476-479, 1960)
(Contract AF 19(604)5969)
(AFCRL-157) Unclassified report

DESCRIPTORS: *Diffraction, *Scattering, Mathematical analysis, *Differential equations, Functions, Physics.

AD-255 692 Div. 15
(11 May 61) OTS price $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
ON THE CONNECTIVITY NUMBERS OF LINEARLY SEPARABLE SETS,
by E. A. Whitmore. Technical rept., Mathematics. Mar 61. 1v. incl. illus. tables. (Rept. no. LMSD-895074)
Unclassified report

DESCRIPTORS: *Mathematical logic, *Algebra, *Transformations (Mathematics), *Number theory.

A formula for certain invariants (the connectivity differences) associated with the points of canonical linearly separable sets of the unit hypercube is derived. These may be used to derive the connectivity numbers of any linearly separable set. It is also proved that for less than 5, or equal to the connectivity numbers uniquely define a canonical linearly separable set; while for n less than or equal to 6, they do not. Some investigation is made of sets of points which can be added to a canonical set to produce two different canonical sets with the same connectivities. Also presented is a simple formulation of the number of line-segments of the unit hypercube which is entirely in a given canonical linearly separable set n, and of the number of such line-segments cut by every hyperplane which separates this set from the other points of the unit hypercube. (Author)

AD-255 696 Div. 15
(9 May 61) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
A NEW CLASS OF CODES,
by Gustave Solomon. 28 Apr 61. 9p. (Rept. no. 47G-0020)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Polynomials, *Groups (Mathematics), Coding, Errors.

Error correcting codes of all (k,p) group codes (p-odd), i.e. linear mappings of k-tuples of zeros and ones into p-tuples of zeros and ones, are viewed as a purely algebraic problem. This problem concerns the zeros of certain polynomials on pth roots of unity. These polynomials are parametrized via elements of subgroups of the smallest field containing the pth roots of unity. The so-called jump-shift register codes are also treated. These are ((p + 1)/2, p) single error-correcting codes for p a prime for which 2 has multiplicative order p-1. These non-cyclic codes are placed in a pseudo-cyclic setting and are easily encodable and decodable. (Author)

AD-255 701 Div. 15
(11 May 61) OTS price $1.60

Maryland U., College Park.
CONTINUOUS DEPENDENCE AND UNIQUENESS IN CAUCHY'S PROBLEM FOR FIRST ORDER, NON-LINEAR, PARTIAL DIFFERENTIAL EQUATIONS, PART II,
by Avron Douglis. 13 Apr 61, 24p. 10 refs.
(Contract AF 49(638)590)
(AFOSR-443) Unclassified report

DESCRIPTORS: *Partial differential equations, Non-linear differential equations, Theory.

AD-255 714 Div. 15, 25
(11 May 61) OTS price $.50.

National Aeronautics and Space Administration, Washington, D. C.
SIMULTANEOUS LEAST-SQUARES APPROXIMATION OF A FUNCTION AND ITS FIRST INTEGRALS WITH APPLICATION TO THERMODYNAMIC DATA,
by Frank J. Zeleznik and Sanford Gordon. May 61, 17p. incl. tables, (Technical note D-767)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-767.

DESCRIPTORS: *Least squares method, Entropy, *Thermodynamics, *Numerical analysis, *Functions, Enthalpy, Integrals, Equations,

A method is presented for the simultaneous least-squares approximation of a function and its first integrals subject to the constraint that the residuals vanish at some point in the interval of the fit. This method is applied to fitting empirical equations to the thermodynamic functions heat capacity, enthalpy, and entropy. Numerical examples indicate, first, that on the basis of the residuals in all the functions a simultaneous fit is superior to fitting heat capacity alone, and second, that no one form of the empirical equation can be considered best for all chemical species over any arbitrary temperature interval. (Author)

AD-255 778 Div. 15, 25
(11 May 61) OTS price $2.60

California U., Berkeley.
THE GREEN'S FUNCTION METHOD AND SUPERCONDUCTIVITY OF SYSTEMS OF FERMIONS,
by Jerzy Sawicki. 1960, 23p. 24 refs.
(Contract AF 49 (638)327)
(AFOSR-245) Unclassified report

DESCRIPTORS: *Green's function, *Functions, *Special functions, *Superconductivity, Matrix algebra, *Differential equations, Fourier analysis, Theory, Series.

The method of Green's functions in the theory of many fermion systems has been recently developed by Gorkov and Migdal for the case of superconducting systems. Some further applications of their formalism are given for zero- and for finite temperatures. The pair distribution function of a superconducting system of fermions is calculated by this method. The perturbation theory for impurities in superconductors described by one-particle operators is further discussed. The problem of residual two-body forces in a superconducting system is discussed. A reaction matrix-type treatment of such forces corresponding to a ladder approximationperturbation theory is indicated. (Author)

AD-255 856 Div. 15
(12 May 61) OTS price $9.60

Stanford Electronics Labs., Stanford U., Calif.
JACOBIAN ELLIPTIC AND OTHER FUNCTIONS AS APPROXIMATE SOLUTIONS TO A CLASS OF GROSSLY NONLINEAR DIFFERENTIAL EQUATIONS,
by A. C. Soudack. 24 Apr 61, 114p. incl. illus. 22 refs. (Technical rept. no. 2054-1)
(Contract Nonr-22524, NR 373 360)
Unclassified report

DESCRIPTORS: Non-linear systems, Functions, Least squares method, *Non-linear differential equations.

Research is concerned with grossly non-linear systems, the characteristics of which are lost in the process of linearization or quasi-linearization. To this end, methods are here developed for approximating directly the solution to differential equations of the form CH double prime + GH prime + F(H) = 0 or Lq double prime + Rq prime + g(q) = 0 where C = capacitance, G = conductance, L = inductance, R = resistance, H = flux, q = charge, and f(H) and g(q) are polynomials wih constant coefficients. These equations represent, respectively, electric circuits with non-linear inductor and non-linear capacitor. Conservative systems are considered where R or G is zero. The approximate solution emerges in the form of Jacobian Elliptic functions. The approximations are compared quantitatively with those obtained by the Ritz averaging method. Dissipative systems are also considered wherein R or G is not zero. A study of the machine solutions led to some tentative approximations in which f(H) or g(q) contains a linear term and a cubic term only. (Author)

AD-255 904 Div. 15
(15 May 61) OTS price $1.60

Syracuse U., N. Y.
MEROMORPHIC FUNCTIONS WITH SECTORS FREE OF ZEROS AND POLES,
by Simon Hellerstein. Jan 61, 15p.
(Contract AF 49(638)571)
(AFOSR-222) Unclassified report

DESCRIPTORS: *Mathematics, *Functions.

Let $f(z)$ be a meromorphic function which is not a polynomial. Assume that all the zeros and poles of f lie on the real axis. Let $\epsilon(>0)$ be given and denote by $n_\epsilon(r,k)$ the number of zeros of $f^{(k)}(z)$ (taking multiplicities into account) which lie in the disk $|z| \leq r$ and outside the angles $-\epsilon < \arg z < \epsilon$; $\pi - \epsilon < \arg z < \pi + \epsilon$. Then for functions of finite order and r sufficiently large, $n_\epsilon(r,k) < (K/\epsilon)r$, where K depends only on f and k. For functions of infinite order $n_\epsilon(r,k) < (K/\epsilon)r^2 \log r \log^2 T(r,f)$, provided r avoids the values of an exceptional set of finite measure, $(T(r,f)$ is the Nevanlinna characteristic of $f)$. The theorem is a consequence of a more general one for meromorphic functions with one sector S free of zeros and poles. Here again it is possible to prove that a sector interior to S contains few zeros of the successive derivatives of f. (Author)

AD-255 969 Div. 15
(15 May 61) OTS price $4.60

Syracuse U., N. Y.
BOUNDS FOR THE NUMBER OF DEFICIENT VALUES OF CERTAIN CLASSES OF MEROMORPHIC FUNCTIONS,
by Albert Edrei and Wolfgang H. J. Fuchs. Jan 61, 46p.
(Contract AF 49(638)571)
(AFOSR-281) Unclassified report

DESCRIPTORS: *Mathematics, *Functions, Theory.

AD-255 989 Div. 15
(10 May 61) OTS price $2.60

Air Force Cambridge Research Labs., Bedford, Mass.
SOME APPLICATIONS OF THE METHOD OF LEAST SQUARES TO ESTIMATING THE PROBABILITY OF A FUTURE EVENT,
by Iver A. Lund. Jan 61, 13p. incl. tables.
(GRD Research notes no. 51; AFCRL-204)
Unclassified report

DESCRIPTORS: *Least squares method, *Probability, *Mathematical prediction, Matrix algebra.

Three variations of the method of least squares were applied to the problem of estimating the probability of each of four categories of six-hour temperature changes at Bedford, Massachusetts. Results indicate that reliable probability estimates can be obtained objectively by least squares techniques applied to predictors which are defined either in discrete, mutually exclusive categories, or as continuous variables. (Author)

16. MEDICAL SCIENCES

AD-255 137 Div. 16
(2 May 61) OTS price $2.60

National Inst. of Health, Tokyo (Japan).
EXPLANATION OF PATHOGENESIS OF JAPANESE B ENCEPHALITIS AND ESTABLISHMENT OF AVIRULENT STRAINS OF JAPANESE B ENCEPHALITIS VIRUS,
by Aikra Oya. Final rept. no. 1, 21 Dec 59-20 Dec 60. 20 Dec 60, 23p. incl. illus. tables, 20 refs.
(Contract DA 92-557-FEC-33136)
Unclassified report

DESCRIPTORS: *Encephalitis viruses, Japan, *Mutations, Viability, Separation, Antibodies, Infections, Mice.

Strains of JBE virus were isolated from mosquitoes and from human autopsied brain materials. Hamster kidney (HK) cells were selected as a host for the former strain to maintain a hypothetical pantropic nature and intraperitoneal-brain passages were performed for the latter to maintain or to exaggerate more neurotropic nature of virus particles. Efforts were made to pick up less virulent virus mutant to adult mouse brain. One day eggs and HK cells were adopted as the hosts to select less virulent mutants from partially attenuated TOP strain of JBE virus. Eventually, a strain came into the light as highly attenuated one showing only a scanty death even when its large amount was inoculated into adult mouse brain. Such an attenuated variant appear to have resulted incidentally rather than being intentionally induced. In the meantime, strains of JBE virus of various histories were examined for virulence to the adult mouse. The attenuated strain was deviated from other laboratory-fixed strains by the decreased intracerebral virulence. (Author)

AD-255 138 Div. 16
(2 May 61) OTS Price $1.60

National Inst. of Health, Tokyo, (Japan).
SEROLOGICAL SURVEY FOR HERPES ANTIBODIES AMONG A POPULATION IN A LIMITED AREA OF TOKYO AND VICINITY AND ATTEMPTS TO GROW HERPES B VIRUS AND RICKETTSIA ORIENTALIS IN THE ONE-DAY OLD EGG,
by Kamesaburo Yoshino. Final rept. no. 2, 21 Dec 60-20 Mar 61. 20 Mar 61, 11p. incl. illus. tables.
(Contract DA 92-557-FEC-33152)
Unclassified report

DESCRIPTORS: *Herpes, *Antibodies, Eggs, Serum, *Viruses, Titration, *Rickettsia, Virus diseases, *Immunology, Japan, Growth, Complement, Culture media, Test methods.

Nineteen more serum samples obtained from outpatients of a hospital and 23 serum samples taken from adult personnel were subjected to nasotracheal (NT) and complement-fixation test (CFT). The data substantiated our previous conclusion that during the first year since birth only a minor or doubtful level of antibody remained by NT but mostly negative titers were obtained by CFT, and from the age of 3 years on both the NT AND CFT antibodies showed significant rises up to the age of 5 yr, after which about 50% of population revealed the presence of antibodies. Among adults, this ratio was about 60%. In order to know what changes have occurred recently in herpes antibody distribution among the Tokyo population, a retrospective study is now going on using serum samples taken and frozen during the past two years. When a freshly isolated herpes B virus was inoculated in 1-day eggs, a luxuriant growth of virus was seen, the highest concentration being found in the CAM-yolk sac portion. The virus growth was better than that occurring after inoculation of 12-day eggs. The virus at the 2nd to 3rd egg passages showed a high 1-day-egg-cidal action so that it could be titrated by the 1-day egg LD titration. Two strains of Rickettsia orientalis, Kato and Karp, were tested for growth in 1-day eggs. Quite different from the cases of virus infection of eggs, the 1-day egg was far less susceptible to the rickettsial infection than older eggs. Serial 1-day egg passages resulted in the loss of rickettsia after 2 to 4 passages. (Author)

AD-255 165 Div. 16
(2 May 61) OTS Price $1.60

New York State U. Downstate Medical Center.
EFFECTS OF NARCOTICS AND RESPIRATORY GASES IN BRAIN INJURY,
by M. H. Harmel and S. W. Weitzner. Final technical rept. 1 Apr 60-31 Mar 61. 20 Apr 61, 10p. incl. illus.
Unclassified report

DESCRIPTORS: *Brain, *Injuries, *Narcotics, Skull, Pressure, Solutions, Injection, Production.

An attempt was made to prepare dogs having increased intracranial pressure, so that their responses to narcotics and anti-narcotics, to ventilation with various gas mixtures, and to apneic oxygenation could be studied, and compared with the cardiovascular and cerebrospinal fluid responses obtained in normal dogs. (Cf, Small et al. Cerebrospinal Fluid pressure Response During Hypercapnia and Hypoxia - Am. J. Physiol. 198:4, 1960). We have determined the dose, and the route of administration, of morphine sulfate (4.0 mg/Kg, subcutaneously) that will cause significant respiratory depression in dogs without cardiovascular depression. A reliable technique for raising intracranial pressure has been developed using a solution Cytal (R), of mannitol and sorbital, which is approximately ten times isotonic. Following the subarachnoid injection of Cytal(R) the cerebrospinal fluid will be above 700 mm. H20 (as high as 1300 mm.) and will remain elevated for at least three hours. Preliminary experiments using this preparation indicate that the cardiovascular and cerebrospinal fluid responses to hypercarbia will be similar to those reported in normal dogs. (Author)

AD-255 197 Div. 16, 1
(3 May 61) OTS price $0.50

National Aeronautics and Space Administration, Washington, D. C.
TOLERABLE LIMITS OF OSCILLATORY ACCELERATIONS DUE TO ROLLING MOTIONS EXPERIENCED BY ONE PILOT DURING AUTOMATIC-INTERCEPTOR FLIGHT TESTS,
by Roy F. Brissenden, Donald C. Cheatham, and Robert A. Champine. Apr 61, 12p. incl. illus.
(Technical note D-810; supersedes NACA Research Memorandum L56K20, AD-120 390)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-810.

DESCRIPTORS: Flight testing, Control systems, *Acceleration tolerance, *Pilots, *Jet fighters, Accelerometers, Test methods, Roll, Moments, Motion, Acceleration, Automatic.

Limited flight test data obtained from an automatically controlled interceptor during runs in which oscillatory rolling motions were encountered were correlated with the pilot's comments regarding his ability to tolerate the imposed lateral accelerations. The results of this correlation indicate that the tolerable limit of the lateral oscillatory acceleration was about + or - 0.4 to + or - 0.5g, measured at the pilot's head in the frequency range from 4 to 9 radians per second. (Author)

AD-255 221 Div. 16
(3 May 61) OTS price $1.10

Columbia U. Coll. of Physicians and Surgeons, New York.
STRUCTURE AND ACTIVITY OF PEPTIDES,
by Bernard F. Erlanger. Final rept. 1 Nov 56-31 May 60. 20 Mar 61, 6p. incl. table, 10 refs.
(Contract Nonr-26644)
Unclassified report

DESCRIPTORS: *Peptides, Proteins, *Enzymes, *Chymotrypsin, Phenyl radicals, Benzyl radicals, Alanines, Esters, Leucine, Amino acids, *Adsorption, Theory, Antibiotics, Biochemistry, Synthesis, Phenylalanine.

A summary of research activities concerned with peptide synthesis and enzyme interaction with insoluble substrates is presented. Antibacterial activity of the peptides was tested and the mode of action is under investigation. The enzyme studies were based on the hypothesis that an enzyme can be selectively adsorbed from an enzyme mixture by an insoluble substrate. Alpha-chymotrypsin and carbobenzyloxy L-leucyl D-phenylalanine benzyl ester (CLPB) interactions pertaining to this hypothesis are discussed.

AD-255 250 Div. 16
(3 May 61) OTS price $2.60

Springfield Coll., Mass.
ELECTROGONIOMETRIC ANALYSIS OF NORMAL AND PATHOLOGICAL GAITS,
by F. Ray Finley and Peter V. Karpovich.
24 Mar 61, 1v. incl. illus. tables.
(Contract DA 49-007-md-889)
Unclassified report

DESCRIPTORS: *Exercise, Electrical equipment, Physiology, Pathology, *Motion, Analysis, Goniometers, *Joints (Physiology), Legs, Measurement.

Subjects with normal and abnormal gaits were used. The changes in the knee and ankle angles were recorded by means of elgons. By using this method, it is relatively easy to determine and measure factors characterizing gait: amount and sequence of angular changes, duration of swing and support phases. The action of artificial limbs in above-the-knee amputees was also recorded and analyzed. (Author)

AD-255 255 Div. 16
(4 May 61) OTS price $1.60

Aerospace Medical Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
PHYSIOLOGICAL INDEX OF STRAIN AND BODY HEAT STORAGE IN HYPERTHERMIA,
by John F. Hall, Jr. and J. W. Polte. Rept. on Physiology of Flight. Jan 61, 13p. incl. illus. tables.
(Proj. no. 7164)
(WADD TR 60-599) Unclassified report

DESCRIPTORS: *Stress (Physiology), *Body temperature, Thermal stresses, Physiology, Perspiration, *Heat tolerance, Heart, Exposure, Storage, Body, Measurement, Determination, Protective clothing, Heat, *Hyperthermia.

Intra- and inter-individual, as well as group, variability of a Modified Craig index of physiological strain and body heat storage was determined and their relationship defined for 5 sitting, nonacclimatized subjects wearing 1 clo body insulation and exposed 5 times to each of three heat stress levels: 38, 54, and 71 C at 10 mm Hg vapor pressure. A linear relationship between physiological strain and thermal stress range studied is shown, although individual variation is marked, especially at higher stress levels. A statistically significant correlation between strain index and body heat storage is shown. Individual and mean variations in heart and sweat rates, and skin, rectal, and body temperatures as related to body heat storage, are illustrated. Data show usefulness of the correlation between strain and heat storage in comparing overall strain resulting from exposure to dissimilar thermal environments for different periods of time. (Author)

AD-255 256 Div. 16
(4 May 61) OTS price $1.60

Aerospace Medical Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
ORGAN OF CORTI'S NEGATIVE INTRACELLULAR POLARIZATION,
by Edward A. Rice. Rept. on Research on the Logical Structure and Function of the Nervous System. Jan 61, 6p. incl. illus.
(Proj. 7232)
(WADD TR 60-778) Unclassified report

DESCRIPTORS: Electric potential, Hearing, Acoustics, Cells (Biology), *Physiology, Polarization, Electrodes, *Anatomy, Nerves, *Ear.

The negative potential located between the basilar membrane and the reticular lamina of the guinea pigs was investigated using several types of electrodes from 3 to 24 microns in diameter. This potential was found intracellular in origin and located within the organ of Corti. The hypothesis that the negative potential found in the scala media of hypoxic animals represents a leakage of the organ of Corti's negative intracellular polarization is supported by these experiments. The negative intracellular polarization of the organ of Corti was found to exist during the life span of the microphonics. The significance of these findings in explaining the origin of microphonics is discussed. (Author)

AD-255 277 Div. 16
(4 May 61) OTS price $1.10

California Inst. of Tech., Pasadena.
THE MECHANISM OF THE HYPERACTIVITY AND PROLONGED ANOXIC SURVIVAL OF SPINAL REFLEXES IN CORDS WHICH HAVE RECOVERED FROM ASPHYXIATION,
by A. Van Harreveld. Progress rept. Apr 60-Apr 61. 24 Apr 61, 4p.
(Contract Nonr-22034)
Unclassified report

DESCRIPTORS: *Spinal cord, Physiology, *Anoxia, Nerves, Histology.

After recovery from asphyxiation for periods of 30 to 35 minutes the remaining reflex activity

consists mainly of an exaggerated extensor tone. This tone will survive renewed asphyxiation for unusually long periods (up to about 15 min). The object of this investigation is to uncover the mechanism underlying these changes in spinal reflexes. (Author)

AD-255 280 Div. 16, 32
(4 May 61) OTS price $2.60

Fordham U., New York.
SELECTED ABSTRACTS FROM SOVIET BIOMEDICAL JOURNALS NO. 5,
by Robert Pollitzer. Mar 61, 1v. incl. tables, 75 refs.
(Contract DA 18-108-405-cml-867)
Unclassified report

DESCRIPTORS: *Bibliography, Abstracting, Medicine, Preventive medicine, Epidemiology, *Communicable diseases, Disease carriers, Immunology, *USSR.

AD-255 293 Div. 16, 20
(5 May 61) OTS price $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
LATENT RADIATION-INDUCED INHIBITION AND RECOVERY OF MITOTIC ACTIVITY IN MOUSE KIDNEY,
by L. J. Cole and V. J. Rosen. 7 Apr 61. 12p. incl. table. (Research and development rept. no. NRDL-TR-503)
Unclassified report

DESCRIPTORS: X-rays, *Radiation effects, *Kidneys, Cells (Biology), *Mitosis, Bone marrow, Injection, Veins, Therapy, Radiation injuries, Inhibition.

Young adult hybrid mice were given an LD100 of 250 KVP X-rays (870 r) in a single whole body exposure. This was followed within a few hours by an I.V. injection of a suspension of bone marrow cells derived from normal mice of the same strain, to enable the mice to survive the otherwise lethal irradiation. Groups of these mice were then subjected to unilateral nephrectomy at 2, 4 and 9 weeks post-irradiation. The remaining kidney was extirpated 48 hr post-nephrectomy, and the mitotic activity determined on stained kidney sections. Mitotic activity was expressed as number of mitoses per 50 high power fields (approx. 400 cells per high power field). It was found that the radiation exposure elicited a latent injury in the kidney cells, which was expressed as an incapacity to initiate cell division following a stimulus to mitosis (i.e., unilateral nephrectomy) applied 2 wk after irradiation. Recovery from this latent damage was evident by 4 wk post-irradiation, when the mitotic activity values approached those observed in non-irradiated controls subjected to unilateral nephrectomy (i.e., 136 and 147 mitoses per 50 fields). At 9 wk post-irradiation there was an overshoot in mitotic activity (as high as 221 mitoses per 50 fields) as compared with the non-irradiated controls. (Author)

AD-255 298 Div. 16
(11 May 61) OTS price $1.50

Mayo Clinic, Rochester, Minn.
EFFECT OF HEADWARD AND FORWARD ACCELERATIONS ON THE CARDIOVASCULAR SYSTEM,
by Earl H. Wood, William F. Sutterer and others. Rept. for 29 May 58-1 Aug 60. Jan 61. 48p. incl. illus. tables.
(Contract AF 33(616)5938; In cooperation with Aerospace Medical Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio)
(WADD TR 60-634) Unclassified report

DESCRIPTORS: *Acceleration tolerance, Physiology, *Circulatory systems, Respiration.

The purpose of this research was to measure cardiac output and related physiological variables in human subjects exposed to acceleration stress in various body orientations. Results of these experiments indicate that an average decrease in cardiac output of 22% of control values occurs in subjects exposed to headward accelerations of 4 g. No systematic change in cardiac output could be demonstrated when these same subjects were exposed to forward accelerations of up to 5 g. As the duration of these exposures to acceleration were increased to 10 minutes, no further alterations in output were demonstrable. Exposure to headward acceleration caused decreases in right atrial and esophageal (intrathoracic) pressure and in the oxygen saturation of arterial blood which were proportional to the magnitude of the acceleration. Forward acceleration, however, caused relatively large increases in right atrial and esophageal pressure but a decrease in arterial oxygen saturation. The decrease in arterial oxygen saturation was prevented by breathing 99.6% oxygen. (Author)

AD-255 411 Div. 16, 2
(4 May 61) OTS price $6.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
TRANSACTIONS OF THE ASTROBOTANY DEPARTMENT OF THE ACADEMY OF SCIENCES, VOLUME 5 (SELECTED ARTICLES).
Dec 60, 66p. incl. illus. tables (Trans. no. MCL-709 from Trudy Sektora Astrobotaniki 5:pp. 110-117, 118-125, 149-161, 207-211 and 221-227)
Unclassified report

DESCRIPTORS: *Plants, *Planets, Pigments, Spectrophotometers, Space medicine, *Spectrographic analysis, *Plant pigments, Ultraviolet radiation, Chlorophylls.

Contents:
Spectrophotometric investigation of the reflection of the near ultraviolet rays by plants, by K. I. Kozlova
Problem of organic evolution in modern study of planets, by N. I. Suvorov
Studying the pigments of anthocyanes in nonochromatic rays, by S. A. Stanko
The philosophical approach to the problem concerning life beyond the earth (extraterrestrial life), by A. K. Suslov
Biogenetic variability of the chlorophyll absorption band in higher plants, by Z. S. Parshina

AD-255 517 Div. 16
(11 May 61) OTS price $8.60

Washington U., Seattle, School of Medicine.
THE EFFECT OF PHYSICAL EXERCISE ON CHOLESTEROL-INDUCED ATHEROSCLEROSIS IN RABBITS,
by Cato Ohrn Gudbrandsen. Feb 61. 85p. incl. illus. tables, 154 refs.
(AAL TR 60-2) Unclassified report

DESCRIPTORS: *Arteriosclerosis, Production, *Cholesterol, Etiology, *Exercise, Bibliography, Lipids, Lipoproteins, Diet, Physiology.

Two groups of ten 3-month-old, male, New Zealand white rabbits were fed an atherogenic diet, ad libitum. This diet contained 0.5% cholesterol and 5% fat (by weight) during the first 63 days for Group I and the first 31 days for Group II; during the last 40 days the diet contained 0.25% cholesterol and 3.5% fat. Exercise, given up to 2 hours per day in a motor-driven drum, was started simultaneously with the diet for four of the animals of Group II; it was started for four of the animals in Group I after 34 days on the atherogenic diet. The effective exercise given was estimated as being only about one-half that given the animals in the previous year's experiment. The ad libitum diet resulted in a much higher intake by the controls than by the exercised animals, with respect to cholesterol, fat and total number of calories. The controls gained an average of 500 to 700 g more than the experimental rabbits. The amount of exercise was considered inadequate in relation to the cholesterol and fat consumed; no significant difference was observed between the exercised and sedentary animal with regard to the blood cholesterol levels, appearance of the serum, grossly visible aortic atherosclerosis, or microscopic quantitative evaluation. (Author)

AD-255 556 Div. 16, 28
(8 May 61) OTS price $4.60

Institute for Psychological Research, Tufts U., Medford, Mass.
LUMINANCE REINTENSIFICATION AT FREQUENCIES FROM 40 TO 300 CYCLES PER SECOND AS A FACTOR IN THE READING OF SIMULATED VISUAL DISPLAYS,
by Mason N. Crook, Harold P. Bishop and others.
Final rept. Oct 60, 37p. incl. illus. tables.
(Contract AF 19(604)4949)
(AFCCDD TR 61-5) Unclassified report

DESCRIPTORS: *Vision, *Display systems, Optical images, Illumination, Reading, Eye, Motion, Simulation, Intensity.

If a visual display is periodically reintensified at a frequency above a certain critical value, no flicker will be perceived with steady eye fixation, but during eye movement a series of spaced images may appear. The effect of this phenomenon on the reading of displays was investigated. Several types of display material were used, and the following conditions were varied; luminance level, luminance contrast, uniformity of luminance among display elements, color, size of characters in the display, spatial extent of display, and frequency, wave form and duty cycle of the periodic reintensification. From a series of experiments, it can be concluded that reintensification above the critical frequency of flicker creates no significant problem for the reading of visual displays. (Author)

AD-255 557 Div. 16, 20
(8 May 61) OTS price $7.60.

Radiation Biology Lab., College Station, Tex.
CHRONIC WHOLE-BODY GAMMA RADIATION STRESS IN THE ALBINO RAT AND MOUSE,
by Sidney O. Brown and George M. Krise. Annual progress rept. Mar 60-Feb 61. Apr 61, 1v. incl. illus. tables, 38 refs. (Rept. no. E-27-61)
(Contract DA 49-007-md-957, Proj. 188)
Unclassified report

DESCRIPTORS: *Gamma rays, Erythrocytes, Radiation effects, *Radiation injuries, Tumors, Reproduction, *Stress (Physiology), Ethyl radicals, Amines, Thiols, Toxicity, Leukocytes, Lymphocytes, Carbohydrates, Metabolism, Testes, Spermatogenesis, Inhibition, Drugs.

Albino rats subjected to whole-body radiation at levels of 0, 2, 5, 10, and 20 r daily ove a 23-hour day using a Cobalt 60 source and fed 7% protein diets have a lower incidence of neoplasms than their irradiated counterparts fed 10 and 27% protein; however, these animals survive for a shorter period. Hematology tests show a dramatic decline in erythroid elements of both male and female rats exposed to 10 r per day, with accompanying leucocytosis, lymphocytosis, and thrombocytosis. Glucose utilization tests on prenatal, postnatal, and pre- and postnatal irradiated albino rats suggest that chronic gamma irradiation produced no apparent defect in glucose homeostasis. Female rats exposed to daily levels of 0, 2, 5, 10, and 20 r gamma radiation at the time of conception produced normal litters devoid of anomalies. These females produced three such litters when allowed to remain continuously in the radiation chamber. Males became sterile on all levels above 2 r daily. Albino mice given varying levels of chronic radiation for five wks showed decreased resistance dependent on the radiation dose when exposed to thermal stress by partial immersion in water at 70 C for five sec. (Author)

AD-255 569 Div. 16
(8 May 61) OTS price $1.10

California U., San Francisco. Medical Center.
STUDIES IN PULMONARY PHYSIOLOGY,
by J. H. Comroe, Jr. Annual progress rept. 1 May 60-30 Apr 61. 18 Apr 61, 4p.
(Contract Nonr-22255, Proj. NR 102-323)
Unclassified report

DESCRIPTORS: *Lungs, *Physiology, *Blood circulation, Measurement, Heart, Respiration, Cold baths, Freezing, Tissues (Biology), Capillaries.

Contents:
Use of a new ultra-rapid freeze technique to study living structure as related to function in the heart and pulmonary circulation
The instantaneous measurement of pulmonary capillary blood flow in man; breath-by-breath measurement of R.Q. in man
The reflex effects on respiration and circulation of sudden immersion of man in cold water
The physiological role and histologic localization of sensory receptors in the pulmonary and coronary circulations

AD-255 588 Div. 16, 20
(8 May 61) OTS price $1.10

Chicago U., Ill.
THE RELATIONSHIP OF BIOCHEMICAL AND ENZYMIC ABNORMALITIES OF CELLS TO RADIATION SUSCEPTIBILITY AND TO THEIR INJURY BY OTHER AGENTS,
by Alf S. Alving. Rept. for 1 Apr 60-28 Apr 61. 28 Apr 61, 2p. incl. illus.
(Contract DA 49-007-md-968)
Unclassified report

DESCRIPTORS: *Cells (Biology), Injuries, Metabolism, *Erythrocytes, Sensitivity, *Stress (Physiology), Anemia, Dehydrogenases, Primaquine, Oxidation, Enzymes; Ultraviolet radiation, *Radiation injuries, Biochemistry.

The present data were obtained during our continuing investigations of primaquine sensitivity in relation to injury by various processes and their relation to disease. Combined in vitro and in vivo studies indicate that the mechanism of hemolysis involves inability of the cell to withstand oxidative stress in the presence of redox intermediates, such as methylene blue or

ascorbic acid. By studies of glucose utilization and ribose formation, the site of action is shown to occur in the oxidative limb of the pentose phosphate pathway with its resultant complete shutdown. Incubation of erythrocyte stromata in hemolyzate has revealed that significant changes in the activities of three of the chief enzymes of the pentose phosphate pathway can be induced simultaneously, both in primaquine-sensitive and normal erythrocytes. The results, with respect to normal erythrocytes, is to obtain a hemolyzate which is like that obtained from primaquine-sensitive erythrocytes. The three changes include inactivation of G-6-PD, activation of glutathione reductase, and, in the presence of TPN, partial inactivation of 6-phosphogluconic dehydrogenase. (Author)

AD-255 593 Div. 16, 1, 20
(11 May 61) OTS price $2.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
THE HEALTH HAZARDS OF RADIOACTIVATED MATERIALS IN NUCLEAR POWERED SEAPLANES,
by John W. Taylor, Elizabeth Reeves, and Emma I. Fessenden. Final rept. 31 Dec 60, 24p. incl. illus. table, 43 refs.(Rept. no. NADC-MA-6039)
Unclassified report

DESCRIPTORS: Hazards, *Radiation hazards, Seaplanes, Nuclear power plants, Particles, Radioactive isotopes, Radioactivity, Aircraft nuclear propulsion.

A preliminary study into the general health hazards of operating a nuclear powered aircraft is presented. Due to the lack of specificity in the design of the aircraft at the time of the investigation, it was necessary to determine from existing data the worst possible radiation environment that could be expected, to use as a basis of comparison for experimental data. For this study, Navy P5M seaplanes were used as prototypes of a possible nuclear aircraft. The nature of the particulate matter in and around the seaplanes was studied as to size and activation possibilities. The results indicated that a variable range of particular size and components exists. By using a high flux level it was possible to identify several elements having long half lives with activation analysis techniques. These results indicate that no special hazard problem will be found in connection with occupied areas of the seaplane. However, in the event that a nuclear powered plane becomes available, much more detailed and specific studies should be carried out to confirm this finding. (Author)

AD-255 725 Div. 16
(10 May 61) OTS price $1.60

Naval Research Lab., Washington, D. C.
EFFECT OF GLARE ON EYE BEHAVIOR DURING GROWTH OF DARK ADAPTATION AND DURING BLACKOUT CONDITIONS,
by L. J. Beardman. Final rept. 21 Apr 61, 14p. incl. illus. tables (NRL rept. no. 5613)
Unclassified report

DESCRIPTORS: *Eye, Physiology, *Dark adaptation, Sensitivity, Tests, Colors.

The changes in a red test field are quite different from changes in a blue test field after eye pre-exposures to tungsten and to red illumination. After the threshold of vision is reached, it takes longer for the form of a red test field to be seen by the fovea if the preadaptation is to red illumination than if the pre-exposure is to tungsten illumination, where the form of a red field is seen as soon as the visible threshold is reached. A study of a blue field shows that the rods near the fovea make the field look much brighter near the fovea, thereby increasing the acuity above that at the fovea. The growth of dark adaptation of the eye to colored test fields was obtained by comparing the apparent luminance of a colored test field as seen by the right eye, after it had been pre-exposed to red or to tungsten radiation, to another calibrated variable field of the same color and size as seen by the left unexposed eye. Exposure to red illumination has a smaller effect than an equal exposure to tungsten light anywhere on the retina (rods and cones), but the extrafoveal region suffers more than the fovea from either type of preadaptation. The effect on dark adaptation of increasing the intensity of illumination of the preadapting light is to decrease the rate of recovery both at the fovea and elsewhere. (Author)

AD-255 745 Div. 16
(12 May 61) OTS price $2.60

Stanford U. School of Medicine, Calif.
STUDIES ON THE KINETICS OF HISTAMINE RELEASE FROM NORMAL AND SENSITIZED TISSUES,
by Christen B. Nielsen and George A. Feigen. Technical rept. 1 May 61, 1v. incl. illus. 24 refs.
(Contract Nonr-22546)
Unclassified report

DESCRIPTORS: *Tissues (Biology), Reaction kinetics, Sensitization, Histamines, Antigens, *Immunology, Histaminase, Inhibition, Antibodies, Ammonia.

The present report deals with the kinetics of reduction of the Schultz-Dale response following repeated cycles of in vitro sensitization and challenge; the effects of antigen and ammonia on the time-course of histamine release from actively and passively sensitized gut strips; with the action of the histaminase inhibitor, semicarbazide, upon these preparations; and with the release of active substances other than histamine. (Author)

AD-255 749 Div. 16
(12 May 61) OTS price $1.10.

Southwestern Medical School, U. of Texas, Dallas.
THE SPECIFICITY OF AN INTESTINAL LIPASE FOR MONOGLYCERIDES,
by James C. McPherson and William W. Burr, Jr. Rept. for 7 June 60-9 May 61 on Studies on Lipid Metabolism Using C14 Labeled Materials. 9 May 61, 7p. incl. tables, 10 refs.
(Contract DA 49-007-md-662)
Unclassified report

DESCRIPTORS: *Lipids, *Metabolism, Rats, *Enzymes, Intestines, Fatty acid esters, *Fatty acids, *Hydrolysis, Preparation, Fats, Radioactive isotopes, Carbon,

An enzyme found in the homogenates of rat intestinal mucosa has been demonstrated to be specific for the hydrolysis of 1- and 2-monoglycerides. During a two hour incubation at 37 C, both 1- and 2-monoglycerides are hydrolyzed to a comparable extent (17-19%). Under the same conditions, di- and triglycerides undergo little or no hydrolysis. This enzyme appears to be different from most enzymes previously reported in the intestinal mucosa or succus entericus. The enzymes

previously reported have their major activity directed toward the hydrolysis of triglycerides only or hydrolyze mono-, di-, and triglycerides at approximately equal rates. The exact role of this monoglyceride specific lipase is difficult to delineate. Since pancreatic lipase is specific for the hydrolysis of the 1- and 3-positions of triglycerides, this enzyme may have a definite role in the completion of normal digestion of triglycerides. (Author)

AD-255 765 Div. 16
(11 May 61) OTS price $5.60

Air Force Missile Development Center, Holloman Air Force Base, N. Mex.
CHIMPANZEE TEMPERATURE-HUMIDITY TOLERANCE TESTS. CONTROL TESTS AT 80 F, 50 PERCENT RELATIVE HUMIDITY,
by Erwin R. Archibald and William E. Ward. Apr 61, 47p. incl. illus. tables (Rept. no. AFMDC TR 61-11)
Unclassified report

DESCRIPTORS: *Heat tolerance, Humidity, Physiology, Respiration, Metabolism, Blood, Urine, Skin, Measurement, Primates.

This report describes the effects of seven temperature-humidity control tests on five restrained immature chimpanzee subjects. The objective of the tests was to collect physiological data from large biological specimens under thermally-neutral environmental conditions. Test parameters were 80 F, 50 percent relative humidity for a duration of 20 hours per test. Physiological measurements recorded were respiration rate, heart rate, rectal temperature and skin temperature. Blood and urine collections were made for a metabolic profile study conducted in conjunction with the test series. Instrumentation procedures and general test techniques are described. Respiration rate in the young chimpanzee is more stable than heart rate. The average skin temperature of the immature chimpanzee is 3 F to 4 F lower than the rectal temperature, and varies considerably. Test results indicate that the subjects were exposed to significant environmental stress, probably attributable to food and water deprivation. (Author)

AD-255 797 Div. 16
(10 May 61) OTS price $1.10.

Science and Tech. Section, Air Information Div., Washington, D. C.
REMEDY FOR RADIATION SICKNESS.
21 Apr 61, 2p. (Trans. from Antibiotics Not Yet Developed; Nauka i Zhizn', 1:61-64, Jan 61) (AID rept. 61-55) Unclassified report

DESCRIPTORS: *Radiation injuries, Therapy, Countermeasures, USSR, Bacteria, Fungi, Antibiotics, Injection, Cancer,

Tsiin, a white, fluffy substance, has been used by Soviet scientists to treat radiation sickness. The substance is a polysaccharide of bacterial origin and was first obtained from the common tea fungus. Tsiin does not cure radiation sickness, but exerts a protective action on the organism. A single injection of tsiin was given to mice irradiated with X-rays and was followed by treatment with antibiotics (streptomycin and bicillin). The injection reduced the death rate of the experimental mice to almost zero. Tsiin also proved beneficial in the treatment of cancer. The tumors of the laboratory mice (those receiving the tsiin injection) weighed 50-60% less than those of the control mice. Thus, tsiin may be used to check the growth of cancer. The chemistry and physics of tsiin have not been established as yet. (Author)

AD-255 934 Div. 16
(17 May 61) OTS price $2.60

Brooke Army Medical Center, Fort Sam Houston, Tex.
MUCORMYCOSIS IN SEVERELY BURNED PATIENTS. REPORT OF TWO CASES PRESENTING EXTENSIVE DESTRUCTION OF THE FACE AND NASAL CAVITY,
by Erwin R. Rabin, George D. Lundberg, and Elmer T. Mitchell, Jr. Rept. on Radiation and Thermal Burns, Jan 61, 20p. incl. illus. 20 refs. (Rept. no. MEDEW RS 1-61)
(Proj. 6X59-06-001)
Unclassified report

DESCRIPTORS: *Burns, *Fungus infections, Diagnosis, Pathology.

Two cases of fatal mucormycosis presenting rapid widespread destruction of the face and nasal cavity are reported as a complication of extensive cutaneous burn injury. Both patients exhibited direct meningeal extension of this mycotic infection in addition to visceral involvement. Early recognition of mucormycosis infection depends upon its distinctive dry, black, ischemic necrosis of the face and nasal cavity with early spread to the orbit and meninges. This unusual clinical picture has been described most often in patients with diabetes mellitus, but has not been reported previously in severely burned patients. (Author)

AD-255 935 Div. 16, 30
(17 May 61) OTS price $1.60

Brooke Army Medical Center, Fort Sam Houston, Tex.
PLASTIC SCINTILLATION COUNTING FOR CONTINUOUS FLOW SYSTEMS,
by Ralph S. Goldsmith, Leonard G. Serafle, and Travis S. Masterson, Jr. Interim rept. on Traumatic Surgery and Shock, Mar 61, 8p. incl. illus. (Rept. no. MEDEW RS 2-61)
(Proj. 6X59-01-001)
Unclassified report

DESCRIPTORS: *Scintillation counters, *Chromatographic analysis, Sensitivity.

A plastic spiral scintillation flow counter is described for use with chromatographic columns. The spiral is sensitive to beta emission and can be used even for low energy isotopes such as carbon-14. A device for determining activity in individual fractions obviates the need for preparing all fractions for counting by other technics. (Author)

AD-255 936 Div. 16
(17 May 61) OTS price $1.60

Brooke Army Medical Center, Fort Sam Houston, Tex.
BACTERIOPHAGE GROUPING OF PS. AERUGINOSA WITH PARTICULAR EMPHASIS ON BURN INFECTION,
by Charles D. Graber, Ruth Latta and others. Rept. on Radiation and Thermal Burns, Mar 61, 14p. incl. illus. tables. (Rept. no. MEDEW RS 3-61)
(Proj. 6X59-06-001)
Unclassified report

DESCRIPTORS: *Burns, *Bacteriophages, *Pseudomonas, Infections, Classification, Antigens.

Based on bacteriophaging of 508 Ps. aeruginosa isolates recovered mainly from burn infections, it has been possible to set up six tentative groupings of these lysotypes. Group 2, 3, 7 pseudomonad phage types were most commonly isolated in all burn infections. Group 16 included pseudomonad lyso-type 16, 95,113 as the agent responsible for the majority of septicemias in this unit. There seemed to be no particular group or phage type associated consistently with the fulminating septicopyemic state invariably fatal in burns. In no case was the initial septicemic phage type supplanted by a different phage type during the burned patient's clinical course. Burn infection pseudomonad phage types of our unit differed somewhat from those of a similar unit in Birmingham, England; greatly from those of a Lima, Peru unit. Fifteen N. I. H. pseudomonads from various sources shown to be distinct serotypes based on O and h antigens were found to have 15 separate phage type patterns. Based on this, the phages employed seem adequate to cover the pseudomonad disease spectrum of burns and other infections. (Author)

AD-255 941 Div. 16, 28
(15 May 61) OTS price $4.60

Biotechnology Lab., U. of Calif., Los Angeles.
ARM PROSTHESIS RESEARCH. OBSERVER PRACTICE. HUMAN THERMAL STUDIES. HUMAN TRACKING.
Progress rept. 15 Mar 61, 39p. incl. illus. tables. (Engineering Dept. rept. no. 61-15)
(Contracts Nonr-23349, AF33(616)5402, N123(60530) 16361A and C1005M-2075)
Unclassified report

DESCRIPTORS: *Prosthetics, *Artificial limbs, *Joints (Physiology), *Heat tolerance, Muscles, Electrical properties, Test equipment, Neuromuscular transmission, Sensory perception, Motor reactions, Reaction (Psychology).

Contents:
Fundamental studies to establish body control sites for application to externally powered prostheses
Engineering analysis of biotechnical factors in control systems
Selected prosthesis application studies
Sensory-motor feedback investigations
Physiological measurements of human thermal tolerance
Construction of high transient rate environmental chamber
Development of a rationale for psychomotor tests measuring performance decrements in extreme environments
Effectiveness of elimination of displayed information with observer practice increase
Research on the performance of human operators of tracking instruments

AD-255 943 Div. 16
(15 May 61) OTS price $1.60

Albert Einstein Medical Center, Philadelphia, Pa.
THE EFFECT OF IRRADIATION ON AUTOLOGOUS SKIN TRANSPLANTS,
by Milton Elkin and Daniele Salvioni. Annual progress rept. Apr 60-Apr 61. Apr 61, 12p. incl. tables.
(Contract DA 49-007-md-943)
Unclassified report

DESCRIPTORS: *Skin, *Transplantation, *Radiation effects, Cysteine.

Localized irradiation in large enough dosage prejudices successful autologous skin transplantation in the rabbit. It appears that the deleterious effects of irradiation in this respect are first manifested in the graft itself; at higher doses, damage to the recipient site prevents takes. At the qualities of irradiation used in these experiments (HVL 0.31 mm Al and 2.2 mm Al), 2200r to the donor skin prevented successful grafting whereas this dose to the recipient site showed no significant diminution in per cent of graft takes as compared to control levels. Administration of cysteine intravenously just before irradiation afforded partial protection to the donor skin. (Author)

AD-255 959 Div. 16
(15 May 61) OTS price $3.60

Naval Radiological Defense Lab., San Francisco, Calif.
LIPIDS OF THE RAT LIVER MITOCHONDRIAL MEMBRANE: EFFECT OF X-IRRADIATION,
by K. L. Jackson and C. Entenman. 11 Apr 61, 28p. incl. illus. tables, 38 refs. (Research and Development Technical rept. no. NRDL-TR-504)
Unclassified report

DESCRIPTORS: *Lipids, Radiation effects, X-rays, Membranes, Fatty acids, Mammals, Liver, *Biochemistry.

Data show that irradiation does not cause a loss of any of the major classes of lipids from the mitochondrial membrane during the first 40 minutes following 1000 r whole-body X-irradiation. Because X-irradiation is known to destroy unsaturated fatty acids from the membrane phospholipids. Rather, irradiation caused an increase in the amounts of the unsaturated fatty acids, linoleic and arachidonic acid, in the phosphatidyl choline fraction of the membrane. It is clear that whatever the mechanism is, whereby liver mitochondria are altered during an early period following irradiation, it does not involve major destruction of lipids in the mitochondrial membrane. (Author)

AD-255 976 Div. 16
(16 May 61) OTS price $.50

Aerospace Medical Lab., Wright Air Development Division, Wright-Patterson Air Force Base, Ohio.
CLOSED ECOLOGY,
by Donald A. Keating and Robert W. Roundy. Rept. on Equipment for Life Support and Aerospace. Mar 61, 11p, incl. illus.
(Proj. 6373)
(WADD TR 61-129) Unclassified report

DESCRIPTORS: *Closed cycle ecological systems, Design, Aerobiology, Space environmental conditions, Space medicine, Space flight, Spaceships.

The concepts of closed ecology as well as the design requirements for three degrees of closure in closed ecological systems have been presented in a fundamental manner basic to the reader's understanding of such aerospace life support systems. The degree of ecological system closure is dependent upon reliability, weight, bulk, energy input, and mission duration. The basic closed ecological system concepts are presented fully with the understanding that the design of such systems is dependent upon future research. Design philosophy has therefore been presented in place of actual design. (Author)

17. METALLURGY

AD-255 011 Div. 17
(1 May 61) OTS price $1.60

Westinghouse Electric Corp., Pittsburgh, Pa.
RESEARCH AND DEVELOPMENT IN HIGH STRENGTH HEAT RESISTANT ALLOYS,
by A. L. Feild, Jr. Interim rept. no. 15, 27 Oct-26 Dec 60. 30 Dec 60, 12p. incl. tables.
(Contract NOa(s) 58-852-c)
Unclassified report

DESCRIPTORS: *Heat resistant alloys, Powder alloys, *Tantalum alloys, Electrodes, Melting, Electric arcs, Sintering, Rolling mills, Hardness, Tungsten alloys, Processing, Machining.

Problems associated with the Phase II scale-up of Ta-base alloys continued to receive most of the attention. Improved methods of preparing alloy mixtures in consumable electrode form were developed, both for initial blending stages and for the actual pressing and sintering operations. Several more Ta alloy ingots were prepared by arc melting, using a dc power source. The hot rolling studies on a number of cast sheet bar Ta alloy compositions were completed. The results of this work were not encouraging and indicated that direct rolling of cast structures in the alloy compositions involved did not appear feasible at the rolling temperature used (1200 C). Additional data were obtained on the elevated temperature hardness of several tantalum-base alloys. Machinability experiments on tungsten ingots gave good results, and conditioning of these ingots no longer presents a major problem. (Author)

AD-255 012 Div. 17
(1 May 61) OTS price $2.60

Westinghouse Electric Corp., Pittsburgh, Pa.
RESEARCH AND DEVELOPMENT IN HIGH STRENGTH HEAT RESISTANT ALLOYS,
by A. L. Feild, Jr. and A. I. Lewis. Interim rept. no. 16, 27 Dec 60-26 Feb 61. 27 Feb 61, 12p. illus.
(Contract NOa(s) 58-852-c)
Unclassified report

DESCRIPTORS: *Heat resistant alloys, Sheets, *Tantalum alloys, Melting, Electric arcs, Extrusion, Explosive forming, Rolling mills, Zirconium alloys, Hafnium alloys.

A total of ten 6-lb Ta alloy ingots have been vacuum arc melted successfully using ac power. These ingots and six others previously melted with dc power were extruded at temperatures up to 1700 C in a Dynapak high energy rate machine. Thirteen of these ingots were extruded with excellent results, one hung up in the die, and two broke up completely when passing through the die. Four extrusions were rolled to 0.100-in.-thick strip in stainless steel cans at 1200 C. Tensile test specimens from the strip are being tested at room, elevated and sub-zero temperatures. Metallographic and hardness data on the Ta-Zr and Ta-Hf binary systems were correlated and preliminary conclusions drawn. (Author)

AD-255 075 Div. 17
(3 May 61) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
STRESS-RUPTURE STRENGTHS OF SELECTED ALLOYS,
by D. P. Moon and W. F. Simmons. 23 Mar 61, 3p. incl. illus. (DMIC Memo. no. 92)
Unclassified report

DESCRIPTORS: *Alloys, *Heat resistant alloys, Stresses, Rupture, Molybdenum alloys, Steel, Titanium alloys, Zirconium alloys, Copper alloys, Aluminum alloys, Stainless steel, Nickel alloys, Brass, Titanium, Vanadium alloys, Tin alloys, Niobium alloys, Tungsten alloys, Tantalum alloys, Mechanical properties, Molybdenum.

AD-255 091 Div. 17
(2 May 61) OTS price $5.60

Illinois U., Urbana.
STUDIES OF BRITTLE-FRACTURE PROPAGATION IN SIX-FOOT-WIDE STEEL PLATES WITH A RESIDUAL STRAIN FIELD,
by F. W. Barton and W. J. Hall. Progress rept. no. 6 on Proj. SR-137. 3 Apr 61. 49p. incl. illus. table.
(Contract NObs-65790; In cooperation with Committee on Ship Structure, National Research Council, Contract NObs-72046)
(Serial no. SSC-130) Unclassified report

DESCRIPTORS: *Steel, *Metal plates, Ship plates, Sheets, *Fracture (Mechanics), Propagation, Velocity, Stresses, Temperature, Deformation, Tensile properties, Tests, Welds, Instrumentation, Oscilloscopes, Strain gages, Welding, Test equipment.

Five plates were prepared and tested; the residual strain field was produced by welding tapered slots cut in the edges of the specimen. The test results clearly showed that the high residual tensile strain at the initiation edge aided the fracture initiation. For specimens with no external applied load, the fractures arrested before completely crossing the specimens; for specimens with external applied loads, even though low in magnitude, the fractures propagated completely across the plates. The recorded fracture speeds were much lower than any previously noted in tests of six-foot-wide plates, ranging from about 4000 fps near the initiation edge to as low as 50 fps in the compressive strain region. The strain response as measured by gages located at various points across the plate showed that the magnitude of peak strain and the size of the strain field associated with the moving crack tip diminished as the fracture propagated through the compressive strain field at reduced speeds. (Author)

AD-255 144 Div. 17, 25
(4 May 61) OTS price $1.60

Lessells and Associates, Inc., Boston, Mass.
ACOUSTIC EMISSION UNDER APPLIED STRESS,
by B. H. Schofield. Progress rept. no. 11, 15 Oct 60-15 Mar 61. 15 Mar 61, 8p. illus. 10 refs.
(Contract AF 33(616)5640)
Unclassified report

DESCRIPTORS: *Acoustics, *Deformation, *Single crystals (Metallurgy), Aluminum, Measurement, Wave transmission, Stresses.

A series of tests were conducted on aluminum

single crystals of the so-called 0.5 orientation. The data obtained to date were studied relative to the physical behavior of the 0.5 specimens and also with regard to that previously obtained on (100) specimens. Various characteristics are presented of the emission and the physical parameters. Again, the data shows a very definite correlation between the emission phenomenon and deformation behavior. It is clear from the information obtained up through the present, that the emission is a consequence of, and is produced by, a particular phenomenological characteristic of the deformation process. Several observations were undertaken to determine the particular aspect of the deformation process acting as the source of this emission energy. (Author)

AD-255 224 Div. 17, 25
(3 May 61) OTS price $2.60

Massachusetts Inst. of Tech., Cambridge.
REPEATED TENSILE LOADING OF IRON AND STEEL,
by C. P. Sullivan, B. L. Averbach, and Morris Cohen. 24 Mar 61, 27p. incl. illus. tables (Technical rept. no. 5)
(Contract Nonr-184135, Proj. 7618)
Unclassified report

DESCRIPTORS: *Fatigue (Mechanics), Steel, Iron, Ferrites, Metallic crystals, Single crystals, Crystals, Plastic flow, Crystal structure, Elasticity, Stresses, Deformation, Hysteresis, Microstructure, Creep, Tensile properties, Fracture (Mechanics), Plasticity, Load distribution.

Fatigue failure can occur under pulsating tension in pure polycrystalline iron and in a hardened and tempered steel. In the former case, it is possible to initiate microcracks at carbides, at grain boundary inclusions, or within the fatigue slip bands. However, these microcracks do not propagate by catastrophic extension because they are blunted by plastic deformation at the ends. By contrast, single crystals and bicrystals of ferrite give no evidence of fatigue microcrack formation because sufficiently high stresses cannot be reached. Inclusions and/or sites formerly occupied by them appear to be an important place for microcrack initiation in hardened and tempered 4340 steel. The ability to propagate appears to be related to the lack of sufficient local plastic flow to blunt the crack. (Author)

AD-255 253 Div. 17, 26
(5 May 61) OTS price $19.75

Ladish Co., Cudahy, Wis.
FORGING PROGRAM TO IMPROVE MECHANICAL PROPERTIES OF LARGE STEEL FORGINGS,
by E. H. Nimmer. Final technical engineering rept. 15 Sep 58-23 May 60. Dec 60, 1v. incl. illus. tables.
(Contract AF 33(600)38060)
(AMC TR 60-7-755) Unclassified report

DESCRIPTORS: *Steel, Forging, Mechanical properties, Heat treatment, Statistical analysis, Aircraft, Landing gear, Tensile properties, Hardenability, Manufacturing methods, Melting, Processing, Tests, Grains (Metallurgy).

This report includes:
Metals Research Lab., Carnegie Inst. of Tech., Pittsburgh, Pa.
STATISTICAL EVALUATION OF MECHANICAL PROPERTIES IN HEAT-TREATED AISI 4340 STEEL.

Statistical analysis of 5,000 test data from nine forgings of AISI 4340 aircraft quality steel for a landing gear component shows that transverse ductility and toughness decrease (1) as a function of distance from surface to center of the ingot, (2) as a function of the hardenability of the particular ingot heat studied, and (3) as a function of the amount of reduction in cross-section when forging the ingot beyond a four to one reduction up to an eight to one reduction. Transverse properties are more affected than longitudinal properties and the effects are more pronounced as the strength level increases in the range to 200,000 - 300,000 psi. (Author)

AD-255 278 Div. 17, 14
(4 May 61) OTS price $1.10

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS ON OXIDATION-RESISTANT COATINGS FOR REFRACTORY METALS,
by W. D. Klopp. 26 Apr 61, 3p. (DMIC Memo. no. 102)
Unclassified report

DESCRIPTORS: *Refractory materials, Metals, Niobium, Tantalum, Molybdenum, Tungsten, Coatings, *Metal coatings, *Ceramic coatings, *Oxidation inhibitors, Aluminum coatings, Zinc coatings, Alloys, Intermetallic compounds, Vapor plating, Cermets, Tantalum plating, *Refractory coatings.

The memorandum reiews recent developments in oxidation-resistant protective coatings for the four refractory metals, niobium, tantalum, molybdenum, and tungsten. (Author)

AD-255 288 Div. 17, 25
(4 May 61) OTS price $1.60

Northwestern U., Evanston, Ill.
STRAIN AGING OF ALPHA-IRON,
by E. Lautenschlager and J. O. Brittain. 10 May 61. 13p. illus. table, 14 refs.
(Contract AF 49(638)780)
(AFOSR-505) Unclassified report

DESCRIPTORS: *Iron, Wire, Deformation, Stresses, *Aging, Temperature, Internal friction, Measurement, Mechanical properties, Tensile properties, Electron transitions, Heat treatment.

An investigation was conducted on fine grained alpha-iron wire to measure the influence of the temperature of deformation on strain aging near room temperature. Specimens were deformed various amounts at 77, 195, or 273 K; aged; and the strain aging followed by either internal friction or return of the yield point measurements. The results show that strain aging occurs in three stages. During the first stage there is small, almost immediate return of the yield point. The solute carbon concentration, as measured by internal friction, remains constant in stage I but is lower than the concentration in the unstrained condition. In the second stage, the solute concentration decreases while the magnitude of the yield point increases. In the third stage, the solute atoms continue to drain from the solution, the yield point approaches a maximum, and the strain hardening coefficient and flow curve increased. (Author)

AD-255 303 Div. 17, 26
(4 May 61) OTS price $8.10

United States Steel Corp., Homestead, Pa.
SANDWICH ROLLED SHEETS.
Interim engineering rept. no. 1, 30 Dec 60, 1v. incl. illus, tables.
(Contract AF 33(600)38482, AMC Proj. 7-762)
Unclassified report

DESCRIPTORS: *Sheets, Quality control, *Manufacturing methods, Rolling mills, Steel, Processing, Production, Thickness, Heat treatment, Stainless steel, Metal plates, Laminates, Sandwich panels, Sandwich construction, Precision finishing.

Sandwich rolling is a process whereby wide, light gauge, high strength steel sheets can be produced to close thickness tolerances on conventional plate mill facilities. The process involves the construction of a sandwich pack assembly enveloping a number of alloy or stainless core plates with carbon steel cover plates to produce a laminated slab which is processed as a single assembly. The use of plate mill facilities makes it possible to produce wide sheets and minimize end-to-end thickness variations and crown by cross rolling. Such facilities also make it possible to establish better sheet thickness controls through the simultaneous reduction of a multiple number of plates since any variation from the desired hot rolled finishing thickness is only fractionally distributed to each sheet. By heating and soaking the core plates prior to rolling and by subsequently annealing the sheets while within the carbon envelope, the need for a protective atmosphere to minimize decarburization is eliminated. (Author)

AD-255 326 Div. 17, 1, 26
(5 May 61) OTS price $2.60

Republic Aviation Corp., Farmingdale, N. Y.
IMPROVED METHODS FOR THE PRODUCTION OF TITANIUM ALLOY EXTRUSIONS,
by M. H. Levine. Interim technical engineering rept. no. 16, 1 Jan-1 Apr 61, 1 Apr 61, 18p. incl. illus. table.
(Contract AF 33(600)34098)
(AMC TR 7-556, vol. 16) Unclassified report

DESCRIPTORS: *Titanium alloys, *Extrusion, Manufacturing methods, Airframes, Materials, Pressure, Tensile properties, Heat treatment, Production, Tests, Induction heating.

The double-T shape originally selected for extrusion studies was replaced with thinner T shapes to be produced by a combination of extrusion and subsequent warm drawing. When satisfactory techniques are developed for Ti-7Al-4Mo alloy, similar shapes are to be produced in Ti-6Al-4V and Ti-4Al-3Mo-1V alloys. It is proposed to use glass lubrication and modifications in practice, such as sleeve extrusion, to reduce the higher pressures encountered in the thin shapes at high extrusion ratios. Drawing speeds up to 24 ft/min at 800 to 1200 F will be investigated with an induction heating coil positioned directly ahead of the draw die. Heating trial results indicate that a 50-kw unit will be required for the warm drawing operation on 1/8-in. T extrusions.

AD-255 358 Div. 17
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
FAILURE OF METALS IN CONTACT WITH LIQUID METAL (Pro Ruynubannya Metaliv Pri IKH Kontaki Z Ridkim Metalom)
by G. V. Karpenko. Nov 60, 12p. incl. illus. table, 14 refs. (Trans. no. MCL-88 from Prikladna Mekhanika 3:13-18, 1957)
Unclassified report

DESCRIPTORS: *Liquid metals, *Metals, *Failure (Mechanics), Machines, Stresses, Aluminum, Mercury.

AD-255 362 Div. 17
(4 May 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
POWDER METALLURGY,
by S. A Tsukerman. 19 Dec 60, 27p. incl. illus. tables. (Trans no. MLC-132 from Poroshkovaya Metallurgiya, pp. 89-96, 125-129, 129-136, and 154-157, 1958)
Unclassified report

DESCRIPTORS: *Powder metallurgy, USSR, Pressure, Density, Temperature, Iron, Mechanical properties, Hydraulic presses, Molds, Molding materials, Graphite, Heat resistant alloys, Bearings, Heating, Oxidation, Controlled atmospheres, Tungsten, Cermets, Cobalt, Tungsten compounds, Titanium compounds, Carbides.

AD-255 365 Div. 17, 26
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INVESTIGATION INTO RECRYSTALLIZATION OF NIOBIUM AND ITS ALLOYS (Issledovaniye Rekristallizatsii Niobiya i ego Splavov)
by Ye. M. Savitskiy, V. V. Baron, and K. N. Ivanova. 10 Oct 60, 11p. incl. illus. (Trans. no. MCL-148 from Inzhenerno-Fizicheskiy Zhurnal 1:38-45, Nov 58)
Unclassified report

DESCRIPTORS: *Niobium alloys, *Niobium, Processing, Sheets, Grains (Metallurgy), Plasticity, Temperature, Microstructure, Heat treatment, Mechanical properties, Physical properties, Additives, Alloys, Tensile properties, Crystallization, Hardness, USSR.

Results of experimental investigations of Nb recrystallization are analyzed as well as the effect of alloying with Si, V, Ti, Cr, Zr, Mo, Ta, W, and La on the temperature of its recrystallization. The effect of these elements on hardness, ductility and the technological properties of niobium alloys were studied. X-ray and microstructure analysis and hardness methods have established the temperature at which recrystallization begins and its dependence on the degree of deformation of Nb produced by the arc fusion method from compact ceramic material. The effect is explained for 11 alloying elements present as 0.2 to wt-% Nb on the temperature of recrystallization. The size of the grain has little effect on the hardness of Nb and its alloys but has considerable influence on its plasticity. A method was worded out for the processing of sheet Nb and its alloys to improve their mechanical and technological properties. (Author)

AD-255 367 Div. 17
(4 May 61) OTS price $11.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SEIZING OF METALS,
by A. P. Semenov. 9 Nov 60, 141p. incl. illus. tables (Trans. no. MCL-262 from Skhvatyvaniye Metallov, pp. 46-101 and 231-252, Moscow, 1958)
Unclassified report

DESCRIPTORS: USSR, Metals, *Adhesion, Bonding, Welding, Diffusion, Pressure, Temperature, *Friction, Cutting tools, Machining.

The phenomenon of the bonding or seizing of metals when subjected to pressure as experienced with accretions on cutting tools or with bearing surfaces in machines is discussed. The conditions which facilitate the occurrence of seizing and the corrective actions taken to prevent seizing of metals are reviewed. A number of useful applications of the solid phase joining of metals are analyzed.

AD-255 379 Div. 17
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ON LAWS GOVERNING THE PROCESS OF COAGULATION OF CARBIDE PARTICLES IN STEEL ABOVE POINT A1 (O Zakonomernostyakh Protsessa Koagulyatsii Karbidnykh Chastits V Stali Vyshe Tochki A1),
by V. I. Psarev. 28 Oct 60, 15p. (Trans. no. MCL-456 from Izvestiya Vysshikh Uchebnykh Zavedeniy Chernaya Metallurgiya 2:93-99, 1959)
Unclassified report

DESCRIPTORS: *Carbides, *Steel, Mechanical properties, Heat treatment, Coagulation, Theory, Temperature, Carbon, Determination, Mathematical analysis, Alloys, USSR.

AD-255 380 Div. 17, 25
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
X-RAY DIFFRACTION STUDY OF THE STRUCTURE OF FERROMAGNETIC ALLOYS Fe-Mo AND Fe-Mo-Co (Rentgenograficheskoye Issledovaniye Struktury Ferromagnitnykh Splavov Fe-Mo i Fe-Mo-Co.),
by B. Ya Pines and I. N. Barutkin. 31 Oct 60, 12p. incl. illus. table (Trans. no. MCL-466 from Fizika Metallov i Metallovedeniye 6:832-837, 1958)
Unclassified report

DESCRIPTORS: *Iron alloys, *Molybdenum alloys, *Cobalt alloys, *X-ray diffraction analysis, *Ferromagnetic materials, *Alloys, Ferromagnetism, Crystal structure, Harmonic analysis, Heat treatment, Microstructure, Stresses, Paramagnetic crystals, Magnetic properties, Deformation, Lattices, USSR.

Harmonic analysis of the form of X-ray diffraction lines is used to determine the magnitude of microstresses and paramagnetic inclusions in alloys Fe-Mo and Fe-Mo-Co after different thermal treatment. Structural characteristics are compared with magnetic properties. The alloys Fe-Mo (79% Fe, 21% Mo) and Fe-Mo-Co (74% Fe, 16% Mo, 10% Co) were studied for the purpose of clarifying the reason for the variation in the coercive force under thermal treatment. (Author)

AD-255 381 Div. 17
(4 May 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MECHANISM OF THE FORMATION OF CRYSTALLINE CRACKS DURING WELDING AND HARD FACING (O Mekhanizme Vozniknoveniya Kristallizatsionnikh Treshchin Pri Svarke I Naplavke),
by I. I. Frumin. 31 Oct 60, 1v. incl. illus. 23 refs.
(Trans. no. MCL-467 from Avtomaticheskaya Svarka 1:88-102, 1957)
Unclassified report

DESCRIPTORS: *Arc welding, Arc welds, *Welding, Welds, *Deformation, Rupture, Heat treatment, Sheets, Metals, *Steel, Metallurgy, Carbides, *Welded joints, Sulfides, Phase studies, Measurement, Crystals, USSR.

Deformations during crystallization of a bead were measured by a sensitive strainometer. At first elongation occured and was replaced by contraction. The temperature at which the cracks occured was measured while beading carbon and chromium-tungsten steels. It was shown that the preheating of materials eliminates elongation during crystallization. Cracks form in the presence of layers of low-melting eutectics on the crystal boundaries. New data are given regarding the affect of sulfur on the occurrence of eutectics. (Author)

AD-255 382 Div. 17
(4 May 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
METALLOGRAPHY AND THERMIC TREATMENT OF METALS (SELECTED ARTICLES).
31 Oct 60, 21p. incl. illus. tables (Trans. no. MCL-468 from Metallovedenie I Termicheskaya Obrabotka Metallov 9:pp. 2-8, 19-22 Sep 59)
Unclassified report

DESCRIPTORS: *Creep, Stresses, *Metals, Metallurgy, *Alloys, Heat resistant alloys, Failure (Mechanics), Reliability, Heat treatment, Determination, *Deformation, Mathematical analysis, Temperature, Theory, USSR, Metallurgical analysis.

THE INTERRELATION OF THE EFFECTS OF CREEP AND STRESS RELAXATION, by I. A. Oding and G. F. Lepin: Equations were derived which confirm the accuracy of the postulate that both creep (at small stresses) and relaxation are the result of one and the same process. The different intensities of these processes are determined by the variations in time of the stress changes.
THE USE OF PARAMETRIC AND TEMPERATURE FUNCTIONS OF LASTING STRENGTH, by N. N. Geminov: It is concluded that, in principle, the Larson-Miller and Manson-Haferd parametric functions are more accurate than the Manson-Succop and Graham-Walles functions, but that particular attention must be paid to the inconsistency of the coefficients when using these functions for the transition from one stress to another.

AD-255 386 Div. 17, 26
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ULTRASONIC TREATMENT OF INDUSTRIAL ARTICLES,
by S. S. Slobodyannikov. 1960, 13p. incl. tables (Trans. no. MCL-492 from Ul'trazvukovaya Obrabotka Promyshlennykh Izdeliy: 43-52, 1958)
Unclassified report

DESCRIPTORS: Ultrasonics, *Metallurgy, Glass, Ceramic materials, Metals, Alloys, Processing, *Manufacturing methods, USSR, Instrumentation, Production, Machines, Machine tools, *Cutting tools, Abrasion.

Ultrasonics in the metal-working industry is discussed. Advantages are listed as productivity, the possibility of working materials in the same degree independently of their electrical properties, precision of machining, fineness of surface, and wear of the tool. The basic factors which affect the process of ultrasonic machining are viscosity of the material worked on, dimensions and quality of the abrasive grain, frequency of the amplitude of the vibrations, and force of the feed.

AD-255 387 Div. 17, 25
(4 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
BORIDE PHASES IN NICKEL CHROMIUM BASE ALLOYS (Boridnyye Fazy v Splavakh na Nikel'khromovoy Osnove),
by N. I. Blok, M. N. Kozlova and others.
2 Nov 60, 7p. (Trans. no. MCL-495 from Zavodskaya Laboratoriya 9:1059-1064, 1959)
Unclassified report

DESCRIPTORS: *Nickel alloys, *Chromium alloys, *Borides, Phase studies, X-ray diffraction analysis, Chemical analysis, Separation, Electrolysis, Electrolytes, USSR.

Conclusions: (1) a method was developed for electrolytic separation of boride phases from Ni-Cr-base alloys. (2) EI437 type alloys revealed chromium boride with tetragonal crystalline structure, corresponding to formula (Cr,Ni)4B3 or (Cr,Ni)5B4, and (3) ZH83 and EI617 type alloys as well as composite alloyed alloys of the ZHS3 type revealed boride with approximate formula (Mo,Cr,W,Ni)4B5, or (Mo,Cr,W,Ni)5B4. (Author)

AD-255 392 Div. 17, 25
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
EFFECT OF THE ACTION OF ULTRASONIC VIBRATIONS IN THE PROCESS OF CRYSTALLIZATION ON THE STRUCTURE AND PROPERTIES OF ALLOYS OF ALUMINUM WITH SILICON,
by N. N. Sirota, Ye. A. Lekhtbrau, and E. M. Smolyarenko. 2 Nov 60, 10p. 21 refs. (Trans. no. MCL-510 from Fizika Metallov i Metallovendeniye 7:880-884, 1959)
Unclassified report

DESCRIPTORS: *Aluminum alloys, *Alloys, *Ultrasonics, *Crystallization, *Silicon alloys, Vibrations, Mechanical properties, Microstructure, Crystal structure, USSR, Metallic crystals, Crystals, Hardness, Viscosity, Impact shock.

The effect of ultrasonic vibrations was studied in the process of crystallization on the structure and mechanical properties of alloys of the system Al-Si. As a result of the action of ultrasonic vibraion on a crystallizing fusion of Al-Si (from 2.5 to 20% of Si) there was a sharp diminution in primary grain size and microstructure. The yield strength increased on the average by 11%; the relative elongation increased by 75%. A general increase in the hardness and impact viscosity of the alloys was noted. (Author)

AD-255 393 Div. 17
(4 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DETERMINING THE CRITICAL INTERVAL OF BRITTLENESS OF SMOOTH TEST PIECES UNDER TENSILE STRESS,
by I. Ye Kontorovich and B. M. Voshedchenko.
2 Nov 60, 8p. (Trans. no. MCL-511 from Zavodskaya Laboratoriya 11:1362-1365, 1957)
Unclassified report

DESCRIPTORS: *Steel, Tensile properties, Brittle materials, Tests, Temperature, Test equipment, Test methods, Deformation, Stresses, USSR, Low temperature research, Fracture (Mechanics), Heat treatment, Thermal stresses.

AD-255 394 Div. 17
(4 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
EFFECT OF RESIDUAL AUSTENITE OBTAINED IN TEMPERING ON THE TOUGHNESS AND FORM OF BREAK IN HIGHLY TEMPERED CHROME-NICKEL-MOLYBDENUM STEEL,
by A. P. Gulyayev and I. I. Slavina. 2 Nov 60, 5p. (Trans. no. MCL-532 from Metallovedenie I Obratbotka Metallov 3:15-17, 1956)
Unclassified report

DESCRIPTORS: *Steel, *Austenite, Chromium alloys, Nickel alloys, Molybdenum alloys, Martensite, Cooling, Heat treatment, Tests, Mechanical properties, Failure (Mechanics), Hardness, Metallurgy, USSR, Pearlite, *Fracture (Mechanics).

AD-255 395 Div. 17
(4 May 61) OTS price $1.10.

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CONCERNING THE NATURE OF THE SCALAR EFFECT IN THE DISINTEGRATION OF METALS,
by Ye. M. Shevandin, I. A. Razov and others.
2 Nov 60, 9p. incl. table, 13 refs. (Trans. no. MCL-533 from Doklady Akademii Nauk SSSR 113:1057-1060, 1957)
Unclassified report

DESCRIPTORS: *Fracture (Mechanics), USSR, *Metals, Stresses, Brittle materials, Steel, Metal plates, Mechanical properties, Tensile properties, Propagation,. Theory, Sheets,

An investigation was made of the scalar effect or size of test specimen on the brittle, semi-brittle, and tensile fracture of notched SKHL-1 experimental steel. Specimen sizes were varied from 5 x 5 x 27.5 to 60 x 60 x 330 mm. Notch depths were varied from 1.5 to 18 mm. The sharpness of the notches was varied from bottom radii of 1.5 to 18 mm in one series and 0.125 to 1.5 mm in another series. The samples were tested in bending by a concentrated force at mid span. It was observed in the case of tensile fracture that the initiation of cracking was independent of sample size. Propagation of cracks was more rapid in the larger samples. In the case of

semi-brittle fracture, the larger samples were characterized by an earlier appearance of crystalline structure and an increase in inclination to brittleness. In the case of brittle fracture, the larger samples were characterized by a decrease of the value of elastic strength In all cases the larger samples were characterized by an increased resistance to deformation at the formation of a flaw.

AD-255 396 Div. 17, 25
(4 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
RESISTANCE OF PLASTIC METALS TO BRITTLE DISINTEGRATION,
by G. V. Uzhik. 2 Nov 60, 5p. (Trans. no. MCL-534 from Doklady Akademii Nauk SSSR 99:685-687, 1954)

Unclassified report

DESCRIPTORS: *Metals, Fracture (Mechanics), USSR, Plasticity, Brittle materials, Shear stresses, Physical properties, Mathematical analysis, Stresses, Load distribution, Plastic flow, Low temperature research, Test methods, Mechanical properties, *Steel, Deformation.

AD-255 397 Div. 17, 25
(4 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PROBLEM OF DETERMINING BRITTLE STRENGTH OF METALS (K Voprosu of Opredelenii Khrupkoy Prochnosti Metallev),
by V. S. Smirnov. 2 Nov 60, 8p. (Trans. no. MCL-535 from Zavodskaya Laboratoriya 3:326-330, 1948)

Unclassified report

DESCRIPTORS: *Metals, USSR, Tensile properties, Shear stresses, Test methods, Forging, Rolling mills, Steel, Aluminum, Deformation, Cylindrical bodies, Fracture (Mechanics), Brittle materials, Physical properties, Crystal structure, Theory, Analysis.

According to contemporary views metal has two resistances to destruction differing in magnitude and physical nature: breaking off resistance (resistance to normal tensile stresses) and shearing strength (resistance to tangential stresses). By properly changing the deformation conditions it is possible to obtain any one type of destruction. In a majority of instances plastic metals suffer deformation due to tangential stresses by shearing. In the case of universal uniform elongation brittle destruction by breaking off should have taken place. It is shown by experiments and theoretical analysis that it is possible to realize a stressed state, close to universal uniform elongation, if transverse rolling is employed. The opening of a hollow during transverse rolling takes place under the influence of normal stresses. Transverse rolling can be employed in the role of a method of mechanical testing for the purpose of determing the brittle qualities of a material. (Author)

AD-255 398 Div. 17, 25
(4 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ON A METHOD OF INVESTIGATING THE NATURE OF DESTRUCTION OF STEEL (O Metodike Issledovaniya Kharaktera Razrusheniya Stali),
by B. S. Natapov. 2 Nov 60, 9p. (Trans. no. MCL-537 from Mekhanicheskiye Metody Ispytaniya 5:576-580, 1949)

Unclassified report

DESCRIPTORS: USSR, *Steel, Mechanical properties, Physical properties, Test methods, Shear stresses, Tensile properties, Fracture (Mechanics), Fractography, Heat treatment, Microstructure.

Conclusions: The study of fractures resulted in more accurately defining the changes in the break off resistance during the tempering of steel. It was assumed that the cause for the drop in break off resistance at high tempering temperatures is the increase in carbide dimensions during the tempering. A hypothesis was formulated for the fact that the cause for premature destruction of the steel can be the cracks originating in cementite or along its facets (edges) and situated simultaneously in the basic ferrite mass. (Author)

AD-255 399 Div. 17
(4 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INCREASING THE LEVEL OF PROPERTIES OF CHROMIUM-MANGANESE-SILICON STEEL BY ADDITIONAL ALLOYING (Povysheniye Urevnya Avoystv Khromonargantsevekreznistoy Stali Puten Dopolnitel'noge Legirovaniya),
by M. P. Braun. 2 Nov 60, 6p. (Trans. no. MCL-538 from Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk 5:119-122, 1955)

Unclassified report

DESCRIPTORS: USSR, *Steel, Mechanical properties, Alloys, Additives, Hardening, Heat treatment, Crystal structure, Lattices, Microstructure, Carbides, Austenite, Martensite, *Metallurgy.

An investigation was carried out on (1) steel containing: 0.23 to 0.28% C, 1.3 to 1.4 Cr, 1.2 to 1.4%Mn and 1.0 to 1.1% Si, and (2) steel of the very same composition but additionally alloyed with one of the elements: W, Ti, Nb, V, B, Ni, or a W + Ti + Ni mixture. Additional alloying of CrMnSi steel considerably improves the hardenability. In addition, compound alloyed steel possesses low austenite stability in the perlite zone which is important for isothermal tempering of billets (for the purpose of reducing the sensitivity to cracking) and sufficient stability of the austenite in the intermediate zone which facilitates a structure of lower needle-shaped troostite and a correspondingly high level of tenacity and strength in layers of large forged pieces situated much deeper from the surface. (Author)

AD-255 400 Div. 17
(4 May 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE HEAT RESISTANCE OF WELDED JOINTS OF NICKEL-CHROMIUM ALLOY TYPE Kh20N80T3Yu (EI437B) (Zharoprohnost' Svarnykh Soyedneniy Nikelekhromovogo Splava Tipa Kh20N80T3Yu (EI437B)),

by B. I. Medovar, A. N. Safonnikov, and P. O. Lents. 2 Nov 60, 35p. incl. illus. tables (Trans. no. MCL-541 from Avtomaticheskaya Svarka, Izdatel'stvo Acad. Nauk, US SSR 2: 3-19, 1959)

Unclassified report

DESCRIPTORS: *Nickel alloys, *Welded joints, Chromium alloys, Heat resistant alloys, Welds, Thermal stresses, Hardening, Processing, *Heat treatment, Aging, Rupture, Failure (Mechanics), Mechanical properties, Grains (Metallurgy), Metallurgy, *Arc welds, *Arc welding, Microstructure, USSR.

It is shown that during automatic arc welding and arcless molten slag welding of alloy EI437B with flouride, oxygen-free fluxes, high heat resistance of the welded joints is attained. Experimental data on the effect of heating stage time of heat-hardening, of cold working on the rupture strength of welded joints are presented. (Author)

AD-255 401 Div. 17
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
A STUDY OF THE DISSOCIATION OF A SUPERSATURATED NICKEL-CHROMIUM-TITANIUM-ALUMINUM SOLID SOLUTION (Vivchennya Protsesiv Rozpadu Peresichenogo Tverdogo Rozchinu Nikel'-Khrom-Titan-Alyuminiy), by V. G. Chorniy. 2 Nov 60, 10p. incl. illus. table (Trans. no. MCL-542 from Dopovidi Akademii Nauk Ukrains'koi SSR 4:362-366, 1957)

Unclassified report

DESCRIPTORS: *Nickel alloys, Chromium alloys, Titanium alloys, Aluminum alloys, Crystal structure, Phase transitions, Mechanical properties, *Dispersion hardening, Lattices, Phase studies, Heat resistant alloys, USSR, *Hardening, Hardness, Deformation, Heat treatment, Solutions, Metallurgy, Solids, Dissociation.

For a proper understanding of the mechanism of hardening in metals and alloys it is important to know which changes in the fine crystal structure will bring about the changes in the mechanical properties. The present paper deals with changes in the fine crystal structure due to the dissociation of a heat-resistant nickel-chromium-titanium aluminum alloy. (Author)

AD-255 402 Div. 17
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
RECRYSTALLIZATION PROCESSES IN NICKEL ALLOYS (Rekristallizatsionnyye Protsessy V Legirovannykh Splavakh Nikelya),
by M. E. Blanter and L. I. Kuznetsov. 2 Nov 60, 12p. incl. illus. table (Trans. no. MCL-548 from Metallovedeniye i Obrabotka Metallov 12:31-36, 1957)

Unclassified report

DESCRIPTORS: *Nickel alloys, Cobalt alloys, Chromium alloys, Molybdenum alloys, Grains (Metallurgy), Microstructure, Deformation, Titanium alloys, Processing, Mechanical properties, Gas turbines, *Crystallization, Heat treatment, Metallurgy, Plasticity, USSR, Hardness.

The wide use of nickel alloys in gas turbine engines has drawn the attention of investigators to these alloys. However, systematic data on the effect of alloying elements on recrystallization processes in binary alloys of nickel are lacking, except for the Ni-W system. Because of this, the effect of Mo, Cr, Ti, and Co on the softening, recovery, and recrystallization process in nickel-base binary alloys was investigated. (Author)

AD-255 404 Div. 17
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE PHENOMENON OF RECOVERY DURING THE AGING OF NICKEL-BASED ALLOYS (Yavleniye Vozvrata Pri Starenii Splavov Na Nikelivoy Osnove),
by N. I. Slesarev. 2 Nov 60, 17p. incl. illus. (Trans. no. MCL-557 from Trudy Omskogo Mashinostroitel' nogo Instituta 1:107-118, 1956)

Unclassified report

DESCRIPTORS: Chromium alloys, *Nickel alloys, Alloys, Metallurgy, *Aging, Processing, Heating, Manufacturing methods, Hardness, Mechanical properties, Tensile properties, *Heat treatment, USSR.

Recovery in the aging of alloy Kh20N80T, indicates that during its heating at a higher temperature the change in properties, characteristic for this elevated temperature of aging after hardening, does not occur at once. The minimum in the hardness of the alloy, attainable during recovery, is lower and the heating time for recovery is less at a higher temperature. With treatment for recovery of the alloy aged after quenching in water, the strengthening obtained during the initial aging is not completely eliminated. With treatment for recovery of the alloy aged after slow cooling from the temperature of diffusion annealing, the strengthening obtained by the alloy during initial aging is completely eliminated. Repeated aging of the alloy after treatment for recovery occurs in the same manner as initial aging; strengthening acquired is determined by the temperature of the repeated aging and prior heat treatment. (Author)

AD-255 405 Div. 17
(4 May 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NEW DEVELOPMENTS IN FOREIGN METHODS OF RATING THE TENDENCY OF STRUCTURAL STEELS TO BRITTLE FRACTURE (Novoye arubezhnoy Metodike Otsenki Sklonnosti K Khrupkomu Razrusheniyu Stroitel' nykh Staley),
by E. S. Volokhvyanskaya and N. P. Shchapov. 3 Nov 60, 26p. incl. illus. 41 refs. (Trans. no. MCL-561 from Zavodskaya Laboratoriya 12:1487-1498, 1955)

Unclassified report

DESCRIPTORS: *Steel, *Fracture (Mechanics), Failure (Mechanics), Test methods, Welds, Welded joints, Brittle materials, Tests, Mechanical properties, Determination, USSR, Structures.

An evaluation of the tendency to brittle fracture is important with respect to the material of welded structures where favorable conditions exist for the formation of brittle fractures, and especially for their development into a through-fracture. Investigators have tried to

account for these conditions when developing new test methods. In the majority of investigations fracture tests were conducted to determine the characteristics of ductility, and the area of the fracture diagram. Notched bars are the most widely used for fracture tests. Fracture tests on smooth and notched bars at lower temperatures are considerably more frequent now than in the prewar period; bending is also used. (Author)

AD-255 406 Div. 17
(4 May 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ARRESTED FAILURE OF HARDENED STEEL (Zaderzhannoye Razrusheniye Zakalennoy Stali),
by S. S. Shurakov. 3 Nov 60, 24p. incl. illus. (Trans. no. MCL-570 from Zhurnal Tekhnicheskoy Fiziki 24:527-536, 1954)
Unclassified report

DESCRIPTORS: *Steel, *Failure (Mechanics), *Fracture (Mechanics), Grains (Metallurgy), Austenite, Deformation, Plasticity, USSR, Mechanical properties, Tensile properties, Load distribution.

The phenomenon of the reduced strength of hardened steel under a static load was investigated. This phenomenon is attributed to plastic deformation proceeding in single, favorably-oriented grains under stresses that are below normal short-time strength. It was established that the development of plastic deformation in time leads to overloading and to the fracture of the boundaries of the initial grains of austenite. (Author)

AD-255 414 Div. 17, 26
(4 May 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CASTING INDUSTRY (SELECTED ARTICLES).
Nov 60, 18p. (Trans. no. F-TS-9892/III from Liteynoye Proizvodstvo 6:pp. 7-8, 18-22, June 57)
Unclassified report

DESCRIPTORS: USSR, *Metals, Castings, *Casting, Metal coatings, Processing, Surface properties, Alloys, Mold washes, Steel castings, Tracer studies, Cast steel, Spectrographic analysis, Iron compounds, Chromium compounds, Carbides, Aluminum alloys, Engine cylinders, Manufacturing methods, Pressure, Hydraulic presses, Internal combustion engines.

Contents:
Surface alloying of profiled castings, by A. M. Mikhaylov and M. I. Serebryakov
Manufacturing automobile cylinder blocks from pressure cast aluminum alloy, by T. I. Orlova

AD-255 456 Div. 17
(8 May 61) OTS price $2.60

Defense Metals Information Center, Columbus, Ohio.
STATISTICAL ANALYSIS OF TENSILE PROPERTIES OF HEAT-TREATED Mo-0.5Ti SHEET,
by H. R. Ogden and G. H. Beatty. 24 Apr 61, 18p. incl. illus. tables (DMIC memo. no. 101)
Unclassified report

DESCRIPTORS: *Molybdenum alloys, Titanium alloys, Tensile properties, Sheets, Statistical analysis, Tests, Thickness, Heat treatment, Mechanical properties.

AD-255 531 Div. 17, 25
(10 May 61) OTS price $2.60

National Aeronautics and Space Administration, Washington, D. C.
ELECTRICAL CHARACTERISTICS OF FOUR TERNARY PLATINUM-RHODIUM-BASE ALLOYS CONTAINING CHROMIUM, COBALT, OR RUTHENIUM,
by Herman H. Lowell, Hubert W. Allen, and Joe E. Jenkins. May 61. 17p. incl. illus. table. (Technical note D-867)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-867.

DESCRIPTORS: Alloys, *Platinum alloys, Cobalt alloys, Chromium alloys, Ruthenium, Rhodium alloys, Electrical properties, Resistance, Electrical conductance, Wire, Anemometers.

Resistivities of small specimens of 5Co-15Rh-80Pt, 5Cr-15Rh-80Pt, 10Cr-15Rh-75Pt, and 5Ru-15 Rh-80Pt were determined for temperatures up to 900 C. Resistance to progressive oxidation was observed in the Co- and Cr-containing alloys. The Co-containing alloy exhibited a shallow minimum of resistivity between about 200 and 400 C, but stability was not attained. The Cr-containing alloys exhibited very high and nearly constant rates of change of resistivity with temperature up to low-temperature reversible transformation points and were electrically stable at all temperatures. The Ru-containing alloy exhibited a linear and stable change of resistivity throughout its (lower) useful temperature range. (Author)

AD-255 659 Div. 17
(10 May 61) OTS price $1.10

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE TECHNOLOGY OF NICKEL-BASE AND COBALT-BASE ALLOYS,
by D. A. Roberts. Rept. for 1 Jan-28 Apr 61. 5 May 61, 4p. (DMIC Memo. no. 104)
Unclassified report

DESCRIPTORS: *Nickel alloys, *Cobalt alloys, Mechanical properties, Rupture, Dispersion hardening, Powder metallurgy, Powder alloys, Creep, Tensile properties, Stresses.

AD-255 719 Div. 17, 12, 25
(10 May 61) OTS price $6.60

National Aeronautics and Space Administration, Washington, D. C.
THEORETICAL ELASTIC STRESS DISTRIBUTIONS ARISING FROM DISCONTINUITIES AND EDGE LOADS IN SEVERAL SHELL-TYPE STRUCTURES,
by Robert H. Johns and Thomas W. Orange. 1961, 63p. incl. illus. (Technical rept. no. R-103)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical rept. R-103.

DESCRIPTORS: *Structural shells, Spheres, Cylindrical bodies, Deformation, Stresses, Conical bodies, Shear stresses, Moments, Theory, Joints, Mathematical analysis, Guided missiles, Spaceships, Airframes, Design, Load distribution, Equations, Elasticity, Mechanical properties.

The deformation and complete stress distribution are determined for each of the following edge-loaded thin shells: (1) a right circular cylinder, (2) a frustum of a right circular cone, and (3) a portion of a sphere. The locations of maximum circumferential and meridional stresses are also found. Equations are developed for discontinuity shear and moment at the following junctions: (1) axial change of thickness in a circular cylinder, (2) axial change of thickness in a cone, (3) change of thickness in a portion of a sphere, (4) a cylinder and a cone, (5) a cylinder and a portion of a sphere, (6) a cylinder and a flat head, and (7) a cone and a portion of a sphere. (Author)

AD-255 822 Div. 17, 26
(15 May 61) OTS price $4.60

Fansteel Metallurgical Corp., North Chicago, Ill.
TUNGSTEN SHEET ROLLING PROGRAM,
by George C. Bodine, Jr. Interim rept. no. 4, 1 Jan-28 Feb 61. 27 Mar 61, 38p. incl. illus. tables.
(Contract NOw-60-0621-c)
Unclassified report

DESCRIPTORS: *Tungsten, *Powder metallurgy, Heat treatment, Sheets, Processing, Production, Industrial production, Manufacturing methods, Rolling mills, Sintering, Grains (Metallurgy), Microstructure, Mechanical properties.

Additional studies were made on the consolidation properties of candidate powders. Pilot billets were upset forged and both pilot resistance and induction sintered bars were rolled to 0.060 in. thick sheet. The sheet was examined for mechanical, metallurgical, and physical properties. The field of candidate materials has been narrowed to three: (1) an undoped powder; (2) an alkali-silicate-aluminum doped material with certain modifications in particle distribution; and (3) an alkali - 1% thoria doped material with certain modifications in particle distribution. (Author)

AD-255 871 Div. 17
(15 May 61) OTS price $12.50

Crucible Steel Co. of America, Midland, Pa.
THE SALT CORROSION OF TITANIUM ALLOYS AT ELEVATED TEMPERATURES,
by E. L. Kochka and V. C. Petersen. Final technical rept. 21 Sep 59-30 Dec 60. 15 Jan 61, 1v. incl. illus. tables, 126 refs.
(Contract NOa(s) 60-6004-c)
Unclassified report

DESCRIPTORS: *Titanium alloys, *Corrosion research, Corrosion, Corrosion inhibition, Stresses, Salts, Temperature, Coatings, Metal coatings, Ceramic coatings, Chlorides, Creep, Sodium compounds, Titanium, Oxygen, Hydrogen, Aluminum coatings, Nickel plating, Surface properties, Additives, Alloys, Oxidation, Corrosive liquids, Chemical reactions.

The corrosion of Ti by salt below 1100F is an over-all oxidation process that proceeds by the following steps: (1) chloride salt reacts with titanium and surface oxides with the liberation of chlorine; (2) chlorine attacks titanium metal; and (3) titanium chlorides oxidize. The reaction is sustained by (a) diffusion of salt into the oxide layer and (b) continued regeneration of chlorine. Accelerated attack above 1100F is the result of a liquid salt phase that forms and improves contact between alloy and corrodent. The attack of stressed super-alpha titanium alloys, processed below the beta transus, is centered in the grain boundaries. Alloys processed at higher temperatures corrode more extensively and crack transgranularly indicating that alloy partitioning occurs and results in thermal sensitization. Chlorine is the primary cracking agent. (Author)

AD-255 942 Div. 17
(15 May 61) OTS price $3.60

Fansteel Metallurgical Corp., North Chicago, Ill.
TUNGSTEN SHEET ROLLING PROGRAM,
by George C. Bodine, Jr. Interim rept. no. 2, 1 Sep-31 Oct 60. 30 Nov 60, 26p. incl. illus. tables.
(Contract NOw 60-0621-c)
Unclassified report

DESCRIPTORS: *Tungsten, *Powder metallurgy, Sheets, Chemical properties, Rolling mills, Physical properties, Processing, Production, Sintering.

Pilot billets were pressed and sintered from candidate powders. The physical and chemical properties of the candidate powders were determined. The evaluation of the pressed and sintered properties of the pilot billets is in process. The selection of candidate powders was based upon a study of materials which would be most suitable for powder metallurgy practice and which would reasonably represent the various types which are within the realm of present or near future commercial production and whose properties might help in the determination of the particular powder type best suited for the objectives of the Tungsten Sheet Rolling Program. The resulting candidate selection includes respective fine, medium, and coarse particle size powder; low density and high density powder; and undoped and doped powder. (Author)

AD-255 984 Div. 17
(15 May 61) OTS price $1.10

Chase Brass and Copper Co., Inc., Waterbury, Conn.
THE DEVELOPMENT OF FABRICATING TECHNIQUES FOR PRODUCING HIGH PURITY RHENIUM STRIP 6 x 6 x 0.005 in.,
by A. H. Springmeyer and J. H. Port. Quarterly rept. no. 3, 1 Jan-31 Mar 61. 13 Apr 61, 2p. tables.
(Contract NOa(s) 60-6066-f)
Unclassified report

DESCRIPTORS: *Rhenium, Powder metallurgy, Sheets, Rolling mills, Hydraulic presses, Sintering, Vacuum furnaces, Heat treatment, Processing, Purification, Chemical properties, Physical properties, Spectrographic analysis, Density, Impurities.

Heavy duty equipment to strengthen the rolling mill was received during early March and is being installed. There was no opportunity to do any rolling because of the extended delivery on this equipment. Several powder compacts were prepared by mechanical pressing and subsequent

sintering treatments. Two samples of vacuum-melted rhenium ingot, about 1 in. thick x 1 in. high were ground with small flats in preparation for rolling at room temperature and 260 C. (Author)

AD-255 992 Div. 17, 26
(16 May 61) OTS price $4.60

Armour Research Foundation, Chicago, Ill.
FIBER-REINFORCED METALS AND ALLOYS,
by N. M. Parikh. Final rept. 19 Feb 60-18 Feb 61. 22 Mar 61, 43p. incl. illus. (Rept. no. ARF 2193-6)
(Contract NOa(s) 60-6081-c)
Unclassified report

DESCRIPTORS: *Metals, *Alloys, *Silver, *Copper, Metallic textiles, Fibers, Steel, Reinforcing materials, Molybdenum, Wire, Tungsten, Mechanical properties, Electrical properties, Heat treatment, Manufacturing methods, Stainless steel.

Fiber felts prepared from short, kinked metal fibers were impregnated with weaker metals. The average concentrations of fibers in matrix metal were 10 to 50 vol-%. It was found that the felting operation itself markedly influenced the mechanical properties of the composites. The fiber diameter also had distinct effects on the degree of reinforcement. In all cases the strength of the composites are directly related to the interfiber spacings and, until some critical value of this parameter is reached, there is very little reinforcement of the matrix by fibers. The incorporation of brittle fibers in a ductile matrix generally results in decrease in elongation and notch-toughness. The experimentally measured elastic moduli compare favorably with values predicted from the theory of elasticity. The degree of reinforcement of matrix by fibers of identical lengths and diameters depends upon the nature of the fibers. (Author)

18. MILITARY SCIENCES AND OPERATIONS

AD-255 161 Div. 18, 26
(2 May 61) OTS price $5.60

Rand Corp., Santa Monica, Calif.
APPLICATION OF THE BAYES TECHNIQUE TO SPARE-PARTS DEMAND PREDICTION,
by W. H. McGlothlin and Eloise E. Bean. 3 Jan 61. 48p. incl. illus. table. (Research memo. no. RM-2701)
(Contract AF 49(638)700)
Unclassified report

DESCRIPTORS: Probability, Air force supplies, Procurement, Air force equipment, *Air force procurement, Errors, Statistical analysis.

A practical method is described for predicting spare-parts demand rates, which may be readily carried out with a few simple, manual computations. The method is an application of Bayes' Theorem of classical probability theory, which combines a priori information and data derived from subsequent events in order to evaluate the likelihood of future events. A previous Research Memorandum (AD-241 043), to which this is a supplement and companion-piece, provided the mathematical explication of the Bayes Theorem and its applicability to demand prediction. The method takes advantage both of initial estimates and of unfolding operational experience -- even when this experience would be dismissed as too limited under current Air Force practices. It should therefore be particularly useful during the early life of a weapon system, when demand data are meager but fairly large commitments must nevertheless be made for spare parts. The study gives the detailed steps of the Bayesian procedure and includes the graphs needed for applying it to aircraft parts. The method can also be used for missiles or other equipment, but the graphs may require modification when operation is measured in units other than flying-hours. (Author)

AD-255 316 Div. 18, 8
(5 May 61) OTS price $3.60

Electronic Defense Labs., Mountain View, Calif.
SPARE PART KITS AT MINIMUM COST,
by Guy Black and Frank Proschan. 13 Oct 58 rev. 4 Dec 59. 33p. incl. illus. tables, 14 refs. (Technical memo. no. EDL-M154, Supersedes AD-208 305)
(Contract DA 36-039-sc-75012)
Unclassified report

DESCRIPTORS: *Electronic equipment, Maintenance, *Supplies, Scheduling, Mathematical analysis, *Costs, *Military procurement.

A study was made to determine spare parts requirements at minimum cost. An approach to spare parts policy and the means of implementing it is indicated. A mathematical statement of spare parts requirement where failure rates are exponential is derived, and the mathematical problem of optimization is solved. A non-mathematical evaluation of the approach outlined is made, including indications of how it might be extended, and the policy implications for military spare parts procurement. (Author)

AD-255 584 Div. 18, 6, 24
(8 May 61) OTS price $9.10

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
A STUDY OF RECONNAISSANCE DATA FROM A BOOST-GLIDE VEHICLE,
by Paul. G. Roetling. 15 Feb 61. 1v. incl. illus. tables. (Rept. no. CM-1418-G-1)
(Contract AF 30(602)2183)
(RADC TR 61-51) Unclassified report

DESCRIPTORS: Propagation, Errors, Velocity, *Supersonic planes, Temperature, Atmosphere, Mathematical analysis, Aerodynamic heating, Target recognition, *Hypervelocity vehicles, Navigation, Stabilization, Radar equipment, *Atmospheric refraction, Distortion, Reconnaissance planes, Aerial cameras, Panoramic scanners, Radar antennas, *Radar scanning, Turbulent flow, *Detection, *Position finding, *Search radar.

Target location and charting using data acquired by boost-glide type vehicles are investigated. Particular emphasis is placed on two aspects of the problem; the use of multiple sensors, and atmospheric effects. The possibility of improving target location accuracy by using combinations of different sensor types is investigated. A parametric analysis provides error contributions due to various sources as functions of altitude, target offset, and sensor

separation in 3-D location systems. Trade-offs between various systems are presented. Atmospheric effects are described analytically. Where experimental data could be obtained, various refraction effects are evaluated numerically and plotted as a function of altitude. (Author)

AD-255 681 Div. 18, 30
(11 May 61) OTS price $9.60

George Washington U., Washington, D. C.
EXPERIENCE IN DATA COLLECTION. IV. ISSUE FOR END USE DATA AS USAGE DATA,
by J. E. Hamilton. 2 May 61. 1v. (Serial no. T-128/60)
(Contract Nonr-76105, Proj. NR 047 001)
Unclassified report

DESCRIPTORS: Research program administration, *Naval logistics, Naval research, *Logistics, Data, Collecting methods, Naval supplies, *Reports, *Records, *Military publications, Naval shore establishments, Naval vessels, Shipyards.

An attempt has been made to show how each ship or supporting activity could maintain records which are essentially issue for end use information which will closely approximate usage data, so that inquiries of all kinds as to material usage may be answered from the record. Each of these records would be useful to the ship or activity itself in taking care of its own demands for loading. The essence of the problem has 4 facets: (1) an exact catalogue of the ship and its installations; (2) a functional classification of all ship's materials; (3) comprehensive and good, enforceable and enforced, policies; and (4) recognition that the ship must provide information to the system before the system can provide material or material guidance to the ship. (Author)

AD-255 855 Div. 18, 30
(12 May 61) OTS price $2.60.

Sylvania Electric Products, Inc., Waltham, Mass.
INSTRUMENTATION FOR CONTINUOUS MONITORING OF SAGE EQUIPMENT.
20 Apr 61, 1v. incl. illus. table. (Suppl. to Rept. nos. TR451-4, vols. 1, 2, and 3, AD-320 397, AD-322 130, and AD-253 314)
(Contract AF 30(602)2071, Proj. 1978)
(Suppl. to RADC TR 60-211) Unclassified report

DESCRIPTORS: *Antiaircraft defense systems, Monitors, *Electronic equipment, Errors, Test equipment, Maintenance, Transducers, *Data processing systems, Teletype equipment, Data transmission systems, Instrumentation, *Radar equipment, Detection, Reliability, Automatic,

Supplementary information is presented concerning the SAGE dynamic monitoring system. Whenever any additional equipment is added to a system, the normal reaction of maintenance oriented personnel is to view the equipment as an additional maintenance burden. It is shown that the over-all maintenance problem is considerably reduced through application and use of a dynamic monitoring system. With the use of the teletype lines for transferring and forward telling of status data, a method becomes feasible for direct production of IBM cards from the encoded teletype tape. The method and a format which is compatible with ADC-06 code manual is discussed. (Author)

AD-255 955 Div. 18, 6
(16 May 61) OTS price $3.60

Operations Research, Inc., Silver Spring, Md.
AN ANALYTICAL MODEL FOR THE EVALUATION OF SURVEILLANCE-SYSTEM COUNTERMEASURES IN A BATTLEFIELD ENVIRONMENT,
by Murray Greyson, Vernon N. Behrns, and Robert R. Hare, Jr. 23 Mar 61, 28p. incl. illus. table (Technical memo. no. 117-61)
(Contract DA 18-108-405-cml-317)
Unclassified report

DESCRIPTORS: *Countermeasures, Operations research, Combat, *Optical systems, *Infrared detectors, *Infrared scanning, *Radar tracking, *Radar scanning, Terrain, Detection, Target recognition, Radar jamming, Smoke screens, Camouflage, Infrared decoys, Analysis, Mathematical analysis, Surface targets, Meteorology, Effectiveness.

A model of a ground-based surveillance system operating in the presence of a countermeasure is developed in terms of mathematical relationships that relate members and locations of observers to the total surveillance capability of the force under consideration. An example is given of the application of the model to a hypothetical battle situation. (Author)

AD-255 999 Div. 18, 1, 2, 31
(16 May 61) OTS price $16.50

Bureau of Naval Weapons, Navy Dept., Washington, D. C.
OPERATIONAL HISTORY OF THE FLYING BOAT. OPEN-SEA AND SEADROME ASPECTS. ATLANTIC THEATRE WORLD WAR II,
by Michael G. Kammen. July 60, 251p. incl. illus. tables.
Unclassified report

DESCRIPTORS: *Flying boats, *Seaplanes, *Seaplane tenders, *Naval operations, *Naval aircraft, Reliability, Atlantic Ocean, *Geography, *Meterorology, Newfoundland, Maintenance, Greenland, Iceland, Caribbean Islands, Bermuda, Great Britain, Germany.

Contents:
Seaplane operations in northern regions
  Newfoundland
  Greenland
  Iceland
Seaplane operations in other Atlantic areas
  Bermuda
  Caribbean and other American operations
  Notes on operations in Europe and North Africa
Methods of tending seaplanes:1941
Comment on British and American operational practices
Notes on German flying boats and seaplane operations
  Aircraft and operational procedures
  Operational experience

19. NAVIGATION

AD-255 261 Div. 19, 12
(3 May 61) OTS price $1.60

Institute of Geodesy, Photogrammetry and Cartography, Ohio State U. Research Foundation, Columbus.
NAVIGATION TECHNIQUES AND DISPLAYS FOR INTER-

PLANETARY SPACE FLIGHT,
by Jack H. Waggoner. Quarterly progress rept. 1 Mar-31 May 59. 31 May 59, 13p. incl. illus. (Rept. no. 813-5-297)
(Contract AF 33(616)5524, Proj. 9(610-6190))
Unclassified report

DESCRIPTORS: *Space flight, Radio signals, *Space navigation, *Display systems, Radar signals, Astronautics, Instrument panels, Propagation.

This rept. includes:
PRELIMINARY DETERMINATION OF AN IMPROVED VALUE FOR THE ASTRONOMICAL UNIT, by Walter Mitchell, Jr., 1959, 3p.

GENERAL FACTORS RELATING TO SPACE SHIP INSTRUMENT PANELS, by Henry Rowe. June 59, 5p.

AD-255 409 Div. 19, 6, 30, 31
(4 May 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MARINE FLEET (SELECTED ARTICLES).
21 Dec 60, 27p. incl. illus. (Trans. no. MCL-662 from Morskoy Flot 6:pp.10-14, 40-41, June 59)
Unclassified report

DESCRIPTORS: *Merchant vessels, Automatic, USSR, Navigation, *Digital computers, Radio waves, *Navigation computers, *Radio navigation, *Inertial navigation, *Position finding, *Radio ranges, Radio equipment, *Direction finding, Propagation, Analysis, Errors, *Bearing finding, *Radio beacons, *Ships.

Contents:
Possibilities of employing electronic digital computers in ship handling
Night effect in operation of omniranges
Omnidirectional radio ranges with phase control of directivity pattern

AD-255 538 Div. 19, 2, 31
(8 May 61) OTS price $3.60

Naval Air Station, Norfolk, Va.
SHIP ROUTING BY NUMERICAL MEANS.
Mar 61, 1v. incl. illus. table (Rept. no. NWRF 32-0361-042)
Unclassified report

DESCRIPTORS: Ships, *Navigation, Navigation computers, Meteorological data, Weather stations, *Course mapping, *Weather forecasting.

AD-255 771 Div. 19, 1, 6
(12 May 61) OTS price $4.60

Pacific Div., Bendix Aviation Corp., North Hollywood, Calif.
SERVICE MANUAL FOR HELICOPTER RADAR ALTIMETER.
1 Sep 60, 17p. illus. (Rept. no. 8-746)
(Subcontract to Bell Helicopter Corp., Fort Worth, Tex., Contract Nonr-167000)
Unclassified report

DESCRIPTORS: *Radio altimeters, Airborne, *Radar equipment, *Helicopters, Maintenance, Test methods, Altimeters, Time, Terrain, *Radar navigation, *Flight instruments, Hazards, *Electronic circuits, Circuits, Instruction manuals, Measurement, Design.

Service information and operating instructions are presented for the Bell helicopter radar altimeter. The helicopter radar altimeter is integrated into the terrain clearance radar or the forward looking three dimensional radar. The altimeter is a pulse radar which measures the time required for the electromagnetic energy to pass from the transmitter to the ground and back to the receiver. The altimeter receiver was originally designed to be used with a terrain clearance radar. The auxiliary terrain clearance radar transmitter was provided to facilitate use of the altimeter as an independent altitude sensor or as an altitude sensor combined with the terrain clearance and ground mapping radar. (Author)

AD-255 981 Div. 19, 1
(12 May 61) OTS price $5.60

Pacific Div., Bendix Aviation Corp., North Hollywood, Calif.
HELICOPTER RADAR ALTIMETER,
by R. A. Salter, M. Ammon, and E. E. Nesbit. Summary engineering rept., 12 Jan-23 Nov 59. 1 Sep 60, 1v. incl. illus. (Rept. no. 8-744)
(Subcontract to Bell Helicopter Corp., Fort Worth, Tex., Contract Nonr-167000)
Unclassified report

DESCRIPTORS: *Helicopters, *Radio altimeters, *Radar equipment, *Flight instruments, Time, Radar pulses, Airborne, *Radar navigation, *Radio navigation, *Electronic circuits, Design, Flight testing, Measurement, Circuits.

The altimeter is a pulse radar which measures the time required for the electromagnetic energy to pass from the transmitter to the ground and back to the receiver. The transmitter was originally designed to be used with a terrain clearance radar. The receiver is of the fire control radar type, with the exception of a low gain feature. The difference between this altimeter pulse radar and conventional radars is the ability of the radar altimeter to measure time to extreme accuracy. The pulse ringing phase comparison time measuring technique was developed at Bendix-Pacific under a proprietary development. This time measurement technique, under laboratory conditions, has provided short term time measurements to 20 micro-micro seconds. The altimeter design objectives were successfully fulfilled, resulting in an altimeter range in excess of 0 to 5000 ft, an accuracy at touchdown of the helicopter of plus or minus 1 foot, with better than 1% linearity, and a hovering accuracy of plus or minus 1 foot throughout the 0 to 5000 ft range. The altimeter was successfully tested under various conditions of roll and pitch attitude and over different grades and levels of terrain. (Author)

20. NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-254 981 Div. 20
(1 May 61) OTS price $2.60

Pennsylvania State U., University Park.
EVOLUTION OF A QUASI-STATIONARY STATE,
by Rolf G. Winter. Interim technical rept. no. 2. 30 Mar 61, 20p. incl. illus.
(Contract DA 36-061-ORD-592, Proj. TB2-0001(1911))
(OOR rept. no. 1911:3) Unclassified report

DESCRIPTORS: *Equations of state, *Radioactive decay, Radioactive decay constant, Wave analysis, Numerical methods and procedures, Particles, Alpha decay.

To elucidate the time development of quasi-stationary states, a simple barrier penetration problem was studied. Both approximate expressions and numerical results for some parameters were obtained for the decay rate. Irregular oscillations occur for a short time, then the exponential region follows, and further oscillations occur during which the decay rate dips to negative values, so that the probability of finding the undecayed system increases briefly at several times. Finally, the decay rate decreases like an inverse power of the time. (Author)

AD-255 004 Div. 20, 25
(1 May 61) OTS price $1.60

Institut de Recherches Nucleaires, Strasbourg (France).
RESEARCH ON THE EXCITED STATES OF LIGHT ATOMIC NUCLEI,
by Serge Gorodetzky. Technical rept. 15 Jan 61, 13p.
(Contract AF 61(514)1400)
(AFOSR-420) Unclassified report

DESCRIPTORS: Nuclear physics, Gamma rays, Nuclear reactions, *Atoms, *Nuclei, *Parity, Radioactive decay, *Excitation, *Nuclear spins, Atomic energy levels, Pair production.

Work concerned studies and experimental investigations of the states of light atomic nuclei, mainly with regard to spins, parities, and transitions between energy levels. The investigation was made by mean of measurement of angular correlation of internal conversion electron pairs or monopolar pairs. (Author)

AD-255 143 Div. 20, 25
(4 May 61) OTS Price $4.60

Floyd Newman Lab. of Nuclear Studies, Cornell U., Ithaca, N. Y.
THE INELASTIC SCATTERING OF MESONS AND BARYONS,
by Michael Nauenberg. Doctoral thesis. 3 Apr 61, 42p. incl. illus. table.
(Contract Nonr-40112)
Unclassified report

DESCRIPTORS: Nuclear physics, Nuclear reactions, Scattering, Particles, *Mesons, *Pions, Nucleons, *Inelastic scattering, Differential cross section, Elastic scattering.

Contents:
The relativistic meson-baryon scattering matrix
Proper Lorentz and space reflection invariance
The center of mass two-component representation
The differential scattering cross-section
Unitary and partial wave expansion
Unitarity below physical thresholds
The analytic properties of partial amplitudes
The Mandelstam representation
Analystic properties of the partial amplitudes
The dispersion relations for partial amplitudes
The scattering length matrix approximation
The partial amplitudes for pi-Y and K-N scattering

AD-255 175 Div. 20, 25, 30
(2 May 61) OTS price $8.10

Washington U., St. Louis, Mo.
DECAYS IN FLIGHT IN A DROP-COUNT CLOUD CHAMBER,
by Chia-Wei Woo. Master's thesis. Rept. on Cosmic Rays. Jan 61. 83p. incl. illus. tables, 41 refs. (Technical rept. no. 9)
(Contract Nonr-81609, Proj. NR 021 046)
Unclassified report

DESCRIPTORS: *Cloud chambers, *Particles, *Radioactive decay, Ionization, Velocity, Counting methods.

Contents:
Scope of the thesis
Apparatus
Mathematical and physical considerations for analysis
Neutral V events
Charged V events
Interaction of a strange particle in gas
Angular distribution of pi-mu decay
Appendix I. List of elementary particles and their properties
Appendix II. A sample calculation
Appendix III. The program, the storage map, the binary listings and results of a sample case for the investigation of angular distribution of pi-mu decay.

AD-255 185 Div. 20, 1, 21
(3 May 61) OTS price $9.60

Convair, Fort Worth, Tex.
THE ANGULAR DISTRIBUTION OF GAMMA RAYS RESULTING FROM NEUTRON CAPTURE IN AIR,
by R. E. Beissner. 14 Apr 61. 119p. incl. illus. tables. (ANP Document no. NARF-61-4T; Rept. no. FZK-9-151)
(Contract AF 33(600)38946)
Unclassified report

DESCRIPTORS: Aircraft, *Nuclear propulsion, Neutrons, Thermal neutrons, Neutron capture, *Neutron capture gamma rays, Gamma rays, *Diffusion, Mathematical analysis, Numerical methods and procedures, Shielding.

An analytic procedure is presented for calculating the angular distribution of gamma rays resulting from neutron capture in air. Numerical results are tabulated for four source-detector separation distances, eight angles of emission at the source, and fifteen initial neutron-energy groups. Agreement with Monte Carlo calculations is within the estimated accuracy of the Monte Carlo data. (Author)

AD-255 208 Div. 20, 17, 25
(3 May 61) OTS price $1.60

General Electric Co., Schenectady, N. Y.
RESEARCH DIRECTED TOWARD THE STUDY OF THE RADIATION DAMAGE THRESHOLDS OF THE ELEMENTS,
by P. G. Lucasson and R. M. Walker. Apr 61, 15p. incl. illus. 19 refs. (Scientific rept. no. 4)
(Contract AF 19(604)5557)
(AFCRL-85) Unclassified report

DESCRIPTORS: Chemical elements, Aluminum, Metals, *Radiation damage, Copper, Iron, Electron bombardment, *Neutron bombardment, Nickel, Gold, Silver.

The variation of the cross section for atomic displacement, (E)sigma sub d, has been measured as a function of bombarding electron energy in the range from 0.5 to 1.3 Mev for Cu, Fe, Ni, Ag, and Al. The (E)sigma sub d curve for copper agrees with previous measurements, but appears to disagree with the recent machine calculations of the Brookhaven group. For Cu, Ni, and Fe the present results, coupled with previous neutron damage data, suggest that the basic damage processes are equivalent both for low and high recoil energies. The Ag results confirm directly that the threshold energy increases with increasing atomic number in the series Cu, Ag,

and Au. All the (E)sigma sub d data with the exception of Al can be fitted with curves calculated from simple threshold functions. The following values of effective threshold energy are found: Cu--22 ev, Ag--28 ev, Ni--24 ev, and Fe--24 ev. The corresponding approximate values for the resistivities of Frenkel pairs are: Cu--1.3 microhm-cm/at-%, Ag--1.4 microhm-cm/at-%, Ni--3.2 microhm-cm/at-%, and Fe--12.5 microhm-cm/at-%. The (E)sigma sub d data for Al do not fit curves calculated from simple threshold functions, and this is interpreted as evidence for multiple defect production in the range of bombarding energies used. (Author)

AD-255 290 Div. 20
(8 May 61) OTS price $6.60

Naval Nuclear Ordnance Evaluation Unit, Albuquerque, N. Mex.
MASS SYSTEMATICS AND ASSEMBLAGE THEORY,
by Russell G. Herron. 26 Nov 60. 53p. incl. illus. tables.
(NAVORD rept. no. 7130) Unclassified report

DESCRIPTORS: *Particles, Theory, *Atomic structure, Atomic mass unit, Protons, Neutrons, Neutron lifetime, Nuclear spins, *Quantum mechanics.

An assemblage theory of matter is presented that depicts elementary particles and atomic nuclei as assemblages of point-like discontinuities in a quantized nuclear field. On the basis of the theory, new particles are predicted; it is argued that the proton and neutron are simply different energy states of the same assemblage; the mean life of the neutron is calculated accurately; and a heuristic mass formula containing four quantized parameters is used to calculate the masses of all elementary particles and isotopes having A less than 34. The mass of the electron is calculated to be 548.7674169... x 10 to the -6th power amu. Nuclear I spin values are predicted for thirty-five light isotopes. It is hypothesized that the masses of all elementary particles and nuclei are systematic and quantized. (Author)

AD-255 350 Div. 20
(9 May 61) OTS price $1.10

Washington U., Seattle.
POLARIZATION OF ATOMIC HYDROGEN AT LOW PRESSURES,
by F. G. Major. Technical rept. no. 2, 1 June 59-31 May 61 on Polarization Exchange Resonance. 31 May 61, 3p. illus.
(Contract Nonr-47725, Proj. NR 014-307)
Unclassified report

DESCRIPTORS: *Hydrogen, *Atoms, Ions, Polarization, Hyperfine structure, Low pressure research, Instrumentation, Nuclear spins, Nuclear resonance.

AD-255 391 Div. 20, 25, 30
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DETERMINING THE CROSS SECTIONS OF ADHESION OF SLOW ELECTRONS TO MOLECULES,
by N. S. Buchel'nikova. 2 Nov 60, 11p. (Trans. no. MCL-509 from Pribory I Tekhnika Eksperimenta 6:89-93, 1958)
Unclassified report

DESCRIPTORS: *Electrons, *Adhesion, *Molecules, Electron beams, Monochromatic light, Electron capture, Measurement, *Collimators, Test equipment, Design.

A setup is described for measuring the cross sections of slow electrons to molecules. The electron beam, collimated by cellular diaphragm and magnetic field (15 - 20 e), passes through the system of lattices and hits the collector. The ions, produced in equipotential region, are collected by a cylindric collector. The differences between contact potentials of lattices are compensated for with the degree of accuracy of approximately 0.02 v. The quasichromatization method was employed in order to obtain monochromatic electrons. This setup makes it possible to measure the cross sections of radiation and dissociative capture, which exceed 10 to the +- 20th power sq cm. The width of electron distribution according to energy constitutes 0.2 - 0.3 ev. (Author)

AD-255 432 Div. 20, 22, 18
(5 May 61) OTS price $6.60

Forest Products Lab., Madison, Wis.
A METHOD FOR ESTIMATING PROBABLE IGNITIONS OF INTERIOR FUELS BY ATOMIC WEAPON EXPLOSION (SURVEY OF BOSTON AND DETROIT),
by H. D. Bruce and L. E. Downs. 1 Feb 56, 1v. incl. illus. tables.
(Technical rept. no. AFSWP-340)
Unclassified report

DESCRIPTORS: Fuels, Ignition, *Atomic bomb damage, Atomic bomb explosions, Blasts, *Civil defense systems, Thermal radiation, Fires.

The purpose of this study was (1) to develop a method by which interior kindling fuels can be surveyed in any urban area, and (2) to obtain primary ignition data from two selected cities, as an example of the type of information that can be obtained by applying the survey method. Common fuels ignitable by the thermal radiation from an atomic fireball are listed with their critical ignition energies as determined by previous laboratory and field studies. For the purposes of the survey, a 60 KT atomic bomb bursting at a height of 1,732 feet was assumed. The blast area around the point of explosion was taken as 6,550 feet in radius from ground zero, and the fire zones as extending from 6,550 feet to 20,626 feet. A survey was made in randomly selected samples of Boston and Detroit, classified into 10 use classes. A record was kept of the kindling fuels that were found to be potential ignition points, and the amount of the effective sky ring to which they were exposed. From these observations, the frequencies of occurrence per acre of potential ignition points in the several [illegible] were tabulated. Also the number of [illegible] per acre that could be exposed in the various use classes was [illegible]

AD-2[illegible]
(10

NUCLEATE BOILING,
by Yih-Yun Hsu and Robert W. Graham. May 61, 43p. incl. illus. tables. (Technical note D-594)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical Note D-594.

DESCRIPTORS: *Nucleate boiling, Analysis, Bubbles, Photographic analysis, Boiling, Schlieren photography, High speed photography, Heat transfer.

The ebullition cycle of nucleate pool boiling from a heating strip was studied through the use of high-speed motion pictures of schlieren and shadowgraph images. The effects of bubble agitation on thermal layer and neighboring bubbles were observed. An over-all model of ebullition based upon experimental observation was proposed that included an analytical method for predicting bubble growth rate and an analysis of the factors that influence the magnitude of the waiting period (time interval between bubbles at a particular site). Thermal-layer thickness, cavity size, and area of influence of a growing bubble are considered. A film supplement is made available. (Author)

AD-255 536 Div. 20
(8 May 61) OTS price $7.60

Nuclear Development Corp. of America, White Plains, N. Y.
FAST NEUTRON CROSS SECTIONS OF MANGANESE, CALCIUM, SULFUR, AND SODIUM,
by E. S. Troubetzkoy, M. H. Kalos and others. Final rept. 1 Dec 59-31 Dec 60. 31 Jan 61, 73p. incl. illus. tables. (Rept. no. NDA 2133-4)
(Contract DA 18-108-405-cml-295)
Unclassified report

DESCRIPTORS: *Neutron cross sections, Manganese, Calcium, Sulfur, Sodium, *Fast neutrons, Tables, Experimental data.

Fast neutron cross sections were prepared for manganese, calcium, sulfur, and sodium. Experimental data were used as much as possible. Gaps in the cross section information were filled by theoretical calculations, interpolations, or extrapolations. Tables of the cross sections are presented. (Author)

AD-255 709 Div. 20
(12 May 61) OTS price $5.60

Naval Radiological Defense Lab., San Francisco, Calif.
A PORTABLE MULTI-PURPOSE RADIATION DETECTION INSTRUMENT,
by G. T. Kiyoi, K. F. Sinclair, and K. Miller. 16 Feb 61, 47p. incl. illus. table (Rept. no. NRDL-TR-495)
Unclassified report

DESCRIPTORS: *Radiation counters, Design, Radiation instruments, *Dosimeters, *Gamma counters, *Beta counters, Measurement, Detection, Sensitivity, Power supplies, Dry cells, Proportional counters, Military personnel, Military equipment, Contamination, Electronic circuits, *Ionization chambers.

A portable high range multi-purpose radiation detection instrument is described. The device performs three separate functions: (1) measurement of gamma dose rate (2) measurement of beta plus gamma dose rate and (3) measurement of beta dose rate in the presence of gamma radiation (by means of gamma cancellation). The ranges of operation for each of these functions are 0 - 2 rad/hr, 0 - 10 rad/hr, 0 - 100 rad/hr, and 0 - 1000 rad/hr in tissue under selected physical conditions. The radiac consists of a dual ionization chamber detector, an electrometer amplifier, and two transistorized power supplies. It is powered by two type D flashlight batteries and will operate continuously in excess of 90 hours with 10% meter light operation. Performance data, design factors, and construction details of the instrument are presented. (Author)

AD-255 770 Div. 20, 32
(15 May 61) OTS price $5.60

Human Sciences Research, Inc., Arlington, Va.
OUTLINE OF AN ANALYTIC APPROACH TO PREDICTING SOCIETAL SYSTEM RECOVERY FROM AN AIR ATTACK,
by William A. Lybrand. Mar 61, 46p. incl. illus.
(Rept. no. HSR-RR-61/1-SE)
(Contract AF 49(638)549, Proj. 9779)
(AFOSR TN 60-1496) Unclassified report

DESCRIPTORS: *Radiological warfare, Recovery, *Radioactive fall-out, *Civil defense systems, Mathematical prediction, Sociology.

The ultimate objective of the present research program is development of a recovery-prediction system that integrates both physical and social effects of thermonuclear air attack. Recovery as an over-all goal in such a situation is defined as the successive accomplishment of three separate subgoals: (1) viability of the surviving society; this refers to the minimum bedrock requirements for human survival (e. g., amounts of food, shelter, clothing), (2) development and maintenance of a war-waging capability, and (3) longer-range ideological, cultural, and societal goals. The particular potential applications of the predictive system are concerned primarily with the first two subgoals. It is important to note, however, that those pre-attack ideological, cultural, and societal factors which are important determinants of viability and war-waging capability are of direct concern to the inquiry. (Author)

AD-255 802 Div. 20, 4, 25
(10 May 61) OTS price $4.60

Columbia U., New York.
THEORETICAL INTERPRETATION OF CARBON-13 HYPERFINE INTERACTIONS IN ELECTRON SPIN RESONANCE SPECTRA,
by Martin Karplus and George K. Fraenkel. Technical note on Research in Electron Spin Resonance. 1 May 61, 1v. incl. illus. tables, 28 refs. (CU-9-61-AF-520-Chem)
(Contract AF 49(638)520)
(AFOSR-398) Unclassified report

DESCRIPTORS: *Carbon, *Nuclear spins, *Hyperfine structure, *Nuclear resonance, Electrons, Atomic orbitals, Theory, Perturbation theory, Quantum mechanics, Chemical bonds, Nuclear models, Isotopes, Mathematical analysis, Polarization, Naphthadenes, Phenyl radicals, Methanes, Methyl radicals, Malonic acids, Benzenes.

A quantitative theory of the isotropic electron-nuclear spin interactions of C-13 in pi-electron radicals is presented and applied to the hyperfine splittings observed in the electron spin resonance spectra of these substances. The theory predicts both the magnitude and sign of the hyperfine splittings and is readily applied to a variety of compounds. For the methyl radical, the measured C-13 splitting is shown to be consistent with a planar model and limits the deviation from planarity to less than or approximately equal to 5 degrees. The theory provides a useful criterion for the validity of approximate wave functions. The sigma-pi interaction parameters are shown to depend on the bond length, the type of hybridization, and on the nature of the bonding atoms. For pi-electron systems, the results demonstrate that the magnitude of the sigma-pi exchange energy is a small fraction of the total energy. (Author)

AD-255 803 Div. 20, 4, 25, 30
(10 May 61) OTS price $4.60

Columbia U., New York.
CARBON-13 HYPERFINE SPLITTING IN THE ELECTRON SPIN RESONANCE SPECTRA OF SEMIQUINONES AND CYCLOOCTATETRAENE,
by Herbert L. Strauss and George K. Fraenkel. Technical note no. 8 on Research in Electron Spin Resonance. 15 Apr 61, 1v. incl. illus. tables, 29 refs. (CU-8-61-AF-520-Chem)
(Contract AF 49(638)520)
(AFOSR-559) Unclassified report

DESCRIPTORS: *Carbon, *Hyperfine structure, *Nuclear spins, *Nuclear resonance, *Quinones, *Cyclooctatetraene, Isotopes, Atomic orbitals, Mathematical analysis, Radio frequency spectrum analyzers, Theory, Measurement, Electrons, Chemical bonds.

Measurements were performed on the C-13 hyperfine splitting in the electron spin resonance spectra of a series of methyl- and chloro-substituted semiquinones and of the cyclooctatetraene anion radical. The splittings were observed from C-13 nuclei present in natural abundance (about 1%); the C-13 satellites were distinguished from spurious low-intensity lines arising from side-reaction produced radical impurities by means of careful intensity measurements as well as other techniques. The largest observed C-13 splitting had a magnitude of 1.7 gauss. In the p-benzosemiquinone ion, a previously observed line of low intensity was identified as a splitting arising from C-13 nuclei, and was assigned, on the basis of intensity measurements, to the 4 CH carbon atoms. Splitting constants tentatively identified with the methyl C atoms of the methyl-substituted compounds were in the neighborhood of 1.5 gauss. The splitting in the cyclooctatetraene anion indicates that the 3 sigma bonds attached to a C atom lie in a single plane. (Author)

AD-255 849 Div. 20, 17
(12 May 61) OTS price $2.60.

Martin Co., Baltimore, Md.
(No title)
Quarterly progress rept. no. 15, Jan-Mar 61, by C. Eicheldinger. Apr 61, 22p. incl. illus. (Rept. no. MND-E-2013)
(Contract DA 44-009-eng-3581)
Unclassified report

DESCRIPTORS: *Heat exchangers, Corrosion, Nickel alloys, Copper alloys, Corrosive liquids, *Nuclear power plants, Steam power plants,

The first series of three 2000-hr autoclave tests on Monel and nickel coupons was completed. In one autoclave, charged with water containing 1000-ppm chloride and 15-ppm oxygen, the Monel coupon in the vapor phase experienced mild pitting. Average corrosion rates were: for Monel, 0.51 mdd; and for nickel, 0.37 mdd (milligrams per square decimeter per day). A 2000-hr autoclave test on nickel, under conditions which caused pitting of Monel, was initiated. The corrosion loop operated virtually continuously during the quarter. Average operating time efficiency (OTE) was approximately 84%. The only major shutdown was caused by failure of terminals on one of the primary 50-kw line heaters. Testing of the bimetal model vessels (MOD SX-4) and the Inconel model vessels (MOD SX-7) continued. Testing of the bimetal miniature vessels (MIN 15 and 16) and the Inconel miniature vessels (MIN 10 and 11) continued. Analysis of heat transfer data was started. Preliminary results for the model vessels indicate that large effects on heat transfer due to scaling have not occurred. (Author)

AD-255 891 Div. 20, 25, 30
(16 May 61) OTS price $5.60

Detroit U., Mich.
CALCULATIONS OF ELECTRON EXCITATION OF FORBIDDEN LINES OCCURRING IN GASEOUS NEBULAE,
by Stanley J. Czyzak. Progress rept. no. 3, 1 Mar 61, 53p. incl. tables.
(Contract Nonr-282000)
Unclassified report

DESCRIPTORS: Wave transmission, *Forbidden transitions, *Electrons, Programming, Tables, *Ions, Phosphorus, Sulfur, Chlorine, Argon, Ionization, *Gas ionization, Excitation, Electron transitions, Atoms, Nebulae, Differential equations, *Nuclear shell models.

Work was primarily devoted to the calculation of the radial wave functions for the various ions of P, S, Cl, and A and these were determined by using the Hartree-Fock method. (Author)

AD-255 899 Div. 20, 30
(15 May 61) OTS price $6.60.

Air Force Special Weapons Center, Kirtland Air Force Base, N. Mex.
SOME RECENT DEVELOPMENTS IN RADIOPHOTOLUMINESCENT DOSIMETRY, INCLUDING TEST RESULTS,
by William C. Bryan and William P. Schaus. Technical note. Dec 60, 62p. incl. illus. tables, 13 refs. (Rept. no. AFSWC TN 61-4)
Unclassified report

DESCRIPTORS: *Dosimeters, Dose rate, *Radiation counters, Measurement, X-rays, Gamma rays, Sensitivity, Nuclear warfare, Nuclear explosions, Atomic bomb explosions, Temperature, Humidity, Fungi, Storage, Design, Phosphate glass, Phosphors, Optical materials, Computers, Tests, Test methods, Calibration, Fluorescence.

Efforts to improve dosimetry in use by the US Air Force and the US Navy have resulted in the development of a new Navy-sponsored model of the Detector, Radiac DT-60/PD and an experi-

mental Air Force modification of the Computer-Indicator, CP-95A/PD. In addition, some refinements have been adopted in the calibration procedures associated with this dosimetry system. The results of testing the new dosimeter and the modification of the computer-indicator at the Air Force Special Weapons Center are reported and the calibration procedures are discussed. Some comments are made on the compatibility of old and new models of the dosimeter with the CP-95A/PD, and on continuing developments. The new DT-60/PD is considered suitable in a nuclear warfare situation if certain limitations, such as the effects of certain extreme environmental conditions and their limited utility for measuring small doses, are recognized. (Author)

AD-255 920 Div. 20, 30
(15 May 61) OTS price $3.60

Air Force Special Weapons Center, Kirtland Air Force Base, N. Mex.
THE TRANSPORT OF NEUTRONS THROUGH THE ATMOSPHERE FOR A BURST HEIGHT OF 50,000 FEET,
by Alexander E. Anthony, Jr. Jan 61, 38p. incl. illus. table (Rept. no AFSWC TN 61-2)
Unclassified report

DESCRIPTORS: *Neutrons, Atmosphere, Sampling, *Neutron flux density, Exosphere, Numerical methods and procedures, *Neutron scattering, Programming, Nuclear reactions.

A series of curves is presented showing the scattered and direct neutron flux per initial neutron from a burst height of 50,000 feet and sampling altitudes from 30,000 to 100,000 feet. The data for these curves were calculated from a Monte Carlo Code. CONCLUSIONS: The data for the 50,000-foot burst height indicate that in the majority of cases, the greatest contributor to the total scattered neutron flux at the receiver is the lower sampling energy band. Generally, the total scattered neutron flux from the 14, 10, 5, and 2 Mev neutrons are fairly close at the same sampling altitude. More specifically, the flux from the lower energy neutrons is slightly higher than the flux from the higher energy neutrons at distances close in to the burst point. The opposite is true at distances farther out from the burst point. (Author)

AD-255 930 Div. 20, 25
(19 May 61) OTS price $3.60

Western Reserve U., Cleveland, Ohio.
MAGNETIC DIPOLE MOMENTS OF ODD-A NUCLEI IN THE SPHERICAL REGION,
by N. Freed and L. S. Kisslinger. 1961, 22p. incl. illus.
(Contract AF 18(603)61)
(AFOSR-173) Unclassified report

DESCRIPTORS: *Nuclear magnetic dipole moments, *Nuclei, *Nuclear physics, Perturbation theory, Nuclear shell models, Magnetic properties, Nuclear forces.

The magnetic dipole moments of odd-A nuclei are calculated and compared to the experimental data for nuclei with particles in the 28-126 shells, except for the deformed region where A is equal to or less than 190 and equal to or greater than 150. The wave functions upon which the calculation is based are admixtures of seniority one wave functions produced by a pairing interaction and obtained by projecting eigenfunctions of the number operator out of Bardeen-type wave functions. Perturbation theory is used to compute the seniority three admixtures produced by a delta-function residual interaction. (Author)

21. NUCLEAR PROPULSION

AD-255 312 Div. 21, 1, 12, 26
(5 May 61) OTS price $5.60

Convair, San Diego, Calif.
DEVELOPMENT OF A HIGH TEMPERATURE NUCLEAR-RADIATION RESISTANT PNEUMATIC POWER SYSTEM FOR FLIGHT VEHICLES,
Monthly progress rept. no. 7 on Phase 2, 25 Mar-24 Apr 61, 50p. incl. illus. tables (Rept. no. ZR-1001-7)
(Contract AF 33(616)7582)
Unclassified report

DESCRIPTORS: *Pneumatic systems, Temperature, *Nuclear propulsion, Control systems, Valves, *Auxiliary power plants, Radiation damage, Pneumatic devices, Servomechanisms, Check valves, Control valves, Safety valves, Test facilities, Control surfaces, High pressure valves, Aircraft equipment, Specifications Pneumatic valves.

Work was directed toward future procurement of components of the pneumatic power system and preparation of performance specifications for the system and for each of the components. System performance requirements are outlined in report SD 61-2001, entitled ''High Pressure Pneumatic System For use in a high Temperature and Nuclear-Radiation Environment''. Component specifications are included for the rotary actuator, servo control valve, pressure regulator relief valve, accumulator, filter, check valve, and cryogenic storage space. These specifications outline the requirements such as operating pressure, pressure drop, leakage and flow rate. The Nuclear Radiation Effects Facility at Fort Worth was consulted to determine the nature of the test equipment available and the type of testing most advantageous. Test chambers with a capacity of about 15.6 cu ft are available. Facilities are also available for any necessary repairs to the components during the tests.

AD-255 794 Div. 21, 20, 30
(10 May 61) OTS price $1.60

Science and Tech. Section, Air Information Div., Washington, D. C.
SOVIET NUCLEAR INSTRUMENTATION AND CONTROL FOR PROPULSION.
Monthly rept. no. 4, 10 Mar-10 Apr 61. 17 Apr 61, 9p. incl. illus.
(AID rept. no. 61-52) Unclassified report

DESCRIPTORS: *Nuclear propulsion, USSR, Instrumentation, Control, Servomechanisms, Electric servomechanisms, Pneumatic servomechanisms, Neutrons, Thermoelectricity, Thermopiles, Boron, Coatings, Analog computers, Digital computers, *Nuclear power plants, Temperature, Measurement.

Contents:
Control components
Electromechanical control components
Neutron-sensitive boron-coated thermopile
Self-saturating magnetic amplifier based on

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a voltage doubling circuit
New products of the Scientific Research Institute for Heat-Power Instrumentation
Pneumatic control components
Three-way electropneumatic valve
New pneumatic analog-computer system
Miscellaneous related subjects
Temperature measurement of the fuel-element shell of the WWR-S reactor

22. ORDNANCE

AD-255 052 Div. 22
(2 May 61) OTS price $8.10

Aberdeen Proving Ground, Md.
ARCTIC WINTER ENVIRONMENTAL TEST OF MORTAR, 81-MM, M29 USING CARTRIDGES, M362 AND XM374,
by F. B. Poughkeepsie. Apr 61, 1v. incl. illus. tables (Rept. no. DPS-204)
(Proj. 501-13-029)
Unclassified report

DESCRIPTORS: *Mortars, Guns, Cartridges, Arctic regions, Tests, *Propelling charges, Propellants, Propellant grains, Projectiles, Interior ballistics, Ammunition, Heat transfer.

The test was designed to furnish data for determining the firing capabilities of the M29 mortar when using the M362 and XM374 rounds under arctic winter conditions. Firing consisted of a series of single-round shots with various propelling charges during which the pressure level and temperature-rise and decay were recorded. It is concluded that the data generated are applicable to the heat-transfer studies of the 81-mm, M29 mortar. (Author)

AD-255 063 Div. 22, 12
(2 May 61) OTS price $2.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
HYPERVELOCITY IMPACT BY COLLISION OF TWO PROJECTILES, PHASE II,
by W. K. Rogers and W. S. Vikestad. Jan 61, 28p. incl. illus. tables (Technical note no. 1381)
(Proj. nos. 503-03-001 and 503-05-010)
Unclassified report

DESCRIPTORS: *Hypervelocity projectiles, *Pellets, *Hypervelocity guns, *Terminal ballistics, Penetration, Launching, Tests, Impact shock, Instrumentation.

A high collision velocity was achieved by firing a steel pellet from a small light-gas gun at a target disk fired from a large smoothbore gun. Through the use of a higher velocity target gun and a modified light-gas pellet gun, the impact velocities obtained were higher than those in the Phase I program reported in BRL Technical Note 1337, August 1960 (AD-245 209). The techniques exploit the use of existing equipment to reach these hypervelocities in a range where the need for impact data is urgent. Collisions were predicted with reliability and precision. The experiment demonstrates the feasibility of adding significant target velocities to many hypervelocity launching techniques. The report discusses the techniques, instrumentation and results of the experiment. (Author)

AD-255 087 Div. 22
(2 May 61) OTS price $2.60

Diamond Ordnance Fuze Labs., Washington, D. C.
ENERGY AND FIRING TIME CONSIDERATIONS IN ELECTRICAL DETONATOR CIRCUITS,
by Walter J. Brinks. 20 Mar 61, 25p. incl. illus. (DOFL rept. no. TR-908)
Unclassified report

DESCRIPTORS: *Electric detonators, Theory, Detonators, Circuits, Resistance, Energy, Temperature, *Explosive trains, Mathematical analysis, Firing mechanisms, Firing circuits.

The firing time and circuit energy of electrical detonator circuits were studied. Two cases are considered, that in which the detonator resistances are constant, and that in which the detonator resistances are linear functions of temperature rise. Two numerical examples are provided. (Author)

AD-255 088 Div. 22
(2 May 61) OTS price $1.60

Diamond Ordnance Fuze Labs., Washington, D. C.
OPTIMUM BURST HEIGHT SETTINGS FOR DUAL PARALLEL FUZE SYSTEMS WHEN INDIVIDUAL FUZE BURST HEIGHTS ARE GAUSSIAN.
by J. J. Serado. 31 Mar 61, 13p. incl. table
(DOFL rept. no. TR-925)
Unclassified report

DESCRIPTORS: *Fuzes, Detonation, Range, Determination, *Fuze setters, High altitude, Mathematical analysis, Mathematical prediction.

A table of optimum burst height settings applicable to fuze systems composed of two independently operating fuzes -- each of which has a Gaussian burst height distribution about a specified HOB -- is provided. The standard deviations of the burst height distribution of both fuzes are assumed identical. Entries of optimum settings, in terms of standard deviation units below desired system burst altitude are tabulated for various intervals defining proper fuze function, combined with dud rates from 0 to 10 percent. A brief discussion of the mathematical background for the table is included. (Author)

AD-255 183 Div. 22
(3 May 61) OTS price $6.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A METHOD FOR COMPUTING INTERIOR BALLISTIC TRAJECTORIES IN GUNS FOR CHARGES OF ARBITRARILY VARYING BURNING SURFACE,
by W. C. Taylor and F. Yagi. Feb 61, 61p. incl. illus. tables. (BRL rept. no. 1125)
(Proj. 503-02-001)
Unclassified report

DESCRIPTORS: *Interior ballistics, Theory, Differential equations, Mathematical analysis, Propelling charges, Guns.

This is a modification and a considerable improvement on the method of BRL Report No. 825 for the calculation of interior ballistic trajectories for guns in cases in which the burning surface varies widely. The improvement is in simplicity of the procedure. The theoretical basis is the same conventional one. (Author)

AD-255 213 Div. 22
(2 May 61) OTS price $9.60

Aberdeen Proving Ground, Md.
BORE-EROSION STUDY OF TWO EXPERIMENTAL AND ONE STANDARD 120-MM, M58 GUN TUBES,
by T. A. Dolton. Apr 61, 1v. incl. illus. tables
(Rept. no. DPS-198)
Unclassified report

DESCRIPTORS: *Gun barrels, Guns, Erosion, Tests, *Interior ballistics, Ballistics, Propelling charges, Armor piercing ammunition, Projectiles, Deterioration, Instrumentation, Test facilities, Rifling, Test equipment, Chromium plating, Tracers (Ordnance).

The report contains results of a bore-erosion study conducted on two modified 120-mm, M58 gun tubes and one standard M58 tube. Each tube was fired to approximately 215 rounds, using identical rounds of ammunition throughout the test. Characteristics studied were rate of erosion, chrome-plate conditions, muzzle-velocity drop-off, chamber-pressure drop-off, and target dispersion. One experimental tube mechanically modified gave target-dispersion and muzzle-velocity data equivalent to the standard tube, while showing less wear at the commencement of rifling. (Author)

AD-255 237 Div. 22
(3 May 61) OTS Price $4.60

Quartermaster Corps, Washington, D. C.
A SET OF ANGLES OF OBLIQUITY FOR USE IN ASSESSING BODY ARMOR,
by Herbert Maisel, Wallace Chandler, and Gerald DeCarlo. Feb 61, 38p. incl. illus. tables (Operational Mathematics series no. 5)
Unclassified report

DESCRIPTORS: *Body armor, Effectiveness, Penetration, Distribution.

Measures of the effectiveness of body armor have been obtained in the past assuming the angle of obliquity is zero, i.e., that the projectiles strike the armor normal to its surface. Since penetrability is a function of the angle of obliquity, it is important to determine the set of angles likely to be encountered and to use this set when assessing body armor. An estimate of the distribution of the angles of obliquity was obtained for fragments striking the upper torso. The procedure used to obtain this estimate is directly applicable to making similar estimates for other parts of the body. (Author)

AD-255 268 Div. 22
(4 May 61) OTS price $3.60

Aberdeen Proving Ground, Md.
FEASIBILITY OF RADIOACTIVE ILLUMINATION AS APPLICABLE TO AN ON-WEAPON FIRE-CONTROL SYSTEM,
by F. B. Poughkeepsie. May 61, 1v. incl. illus. tables (Rept. no. DPS-196)
Unclassified report

DESCRIPTORS: *Fire control systems, *Sights, Gun sights, *Luminescent materials, Tests, *Phosphors, Shielding, Test methods, Shock, Temperature, Vibration, *Illuminated sights, Mortars, Illumination, *Radioactivity, Thallium, Tritium, Radioactive isotopes.

An M34A2 sight unit incorporating radioactively stimulated phosphors was subjected to a series of tests to determine the advantages of built-in self-illumination of scales, level vials and reticle; adequacy of illumination, effectiveness of sealing and shielding techniques; and compatibility of the radioactive-illumination design with military environmental requirements. It was concluded that the radioactively stimulated phosphors provided an effective and more convenient means of illuminating the scales, level vials and reticle of the mortar fire-control equipment than that provided with the standard M34A2 and XM53 sight units. There was no evidence of radiation leaks after the sight unit was subjected to the different environmental conditions used. There was evidence of some mud, dust and water accumulation in the internal components of the sight unit affecting its over-all performance, and when mounted to the 81-mm mortar, the sight unit showed some adverse effects from firing shock. However, this occurrence was also evident with the standard M34A2 and XM53 sight units. It is recommended that consideration be continued towards the use of radioactively stimulated phosphors for illuminating the level vials, scales and reticle of fire-control equipment. (Author)

AD-255 308 Div. 22
(5 May 61) OTS price $5.60

Aberdeen Proving Ground, Md.
COMBINED ENGINEERING-USER TEST OF PRIMER, PERCUSSION, XM82, FOR BAG-LOADED FIELD-ARTILLERY AMMUNITION,
by Keith T. Dixon. Apr 61, 1v. incl. illus. tables. (Rept. no. DPS-227)
(TPR no. TE-263)
Unclassified report

DESCRIPTORS: *Primers, Tests, Design, Effectiveness, Firing mechanisms, *Electric primers.

The XM82 primer was evaluated in test firings. The XM82 is a percussion-only primer designed for use in the XM35 firing lock on the new long-range 155-mm howitzers, the T255E2 and T258, and the 175-mm, T256. It is also intended to be a replacement for the MK15 Navy and T106E1 percussion-electric primers currently being used in the field in various bag-loaded field-artillery weapons. These weapons use either the M34 (T106E1) or T95, firing locks. The results of the test firings indicated that the XM82 primer is satisfactory with regard to ease of insertion, reliability, metal-parts security, and obturation when fired in the M34 and XM35 firing locks. It is recommended that the XM82 percussion primer be considered satisfactory to replace both the MK15 and T106E1 primers, but that additional development be done to eliminate the objectionable extraction and ejection difficulties. (Author)

AD-255 352 Div. 22, 17
(9 May 61) OTS price $6.60

Frankford Arsenal, Philadelphia, Pa.
INVESTIGATION OF SEMI-FINISHED FORGING QUALITY BLOOMS FOR MANUFACTURE OF 8 INCH H.E. M106 SHELL BY HOT FORGING,
Final technical rept. Mar 61, 1v. incl. illus. tables (Rept. no. MIC-165)
Unclassified report

DESCRIPTORS: High explosive ammunition, *Projectiles, Manufacturing methods, *Steel, Specifications, Ordnance steel, Forging, Processing.

A total of 47 1/2 heats of semi-finished forging quality steel were processed into acceptable 8-in., M106, HE, forged shells. Because of the greater dimensional variations and extensive surface conditioning experienced with semi-finished forging quality blooms procured under ASTM Spec. A 273-54, Sec. 1 through 14, a preforming operation was introduced prior to the piercing operation. An evaluation of semi-finished forging quality steel from four steel suppliers, and of shell quality steel from two producers was made on the basis of surface condition, weight and dimensions of the raw material, chemical composition, parting characteristics, forgeability,

forging defects and percentage of scrap loss. A metallurgical examination of semi-finished forging quality and shell quality steel was conducted to determine any inherent differences in the two steel qualities. A substantial cost savings per end item is indicated through the use of semi-finished forging quality steel combined with unit weight reduction. End item inspection showed that 8-in shells produced from semi-finished forging quality steel are equal in every respect to items produced from shell quality steel. (Author)

AD-255 372 Div. 22
(15 May 61) OTS price $8.10

Aberdeen Proving Ground, Md.
ESTABLISHMENT OF CHARGE WEIGHTS FOR CHARGE, PROPELLING, 155-MM, XM51E1,
by S. S. Sine. May 61, 1v. incl. illus. tables. (Rept. no. DPS-209)
(Picatinny Arsenal rept. no. TPR TE-267)
Unclassified report

DESCRIPTORS: *Propellants, Propelling charges, Tests, Howitzers, Physical properties, Acceptability.

Tests were conducted to establish charge weights for charge, dual-granulation, XM51E1, for the 155-mm howitzer, T258. The M17 propellant tested consisted of a single-perforated propellant for the base charge and a multiperforated propellant for charges 2 through 6. In the early phases of the test, the single-perforated propellant produced very erratic chamber pressures when fired with the zone 6 charge. To establish a satisfactory propelling charge, lot PA-E-31526 was replaced with a previously tested, multi-perforated, M17 propellant. Using the multi-perforated propellant (web 0.019 inch) in zone 1, and 0.0576-inch-web propellant in zones 2 through 6, a satisfactory charge establishment was completed at normal and extreme temperatures. The single-perforated propellant was considered satisfactory for use only as a zone 1 charge. (Author)

AD-255 403 Div. 22
(15 May 61) OTS price $3.60

Aberdeen Proving Ground, Md.
FUNCTIONING EFFECTS ON CARTRIDGE, 106-MM, HEP-T, M346A1, WITH SPACER AND SPACER RETAINER AT VARIOUS POSITIONS,
by P. D. Alston. May 61, 1v. incl. illus. tables. (Rept. no. DPS-210)
(Picatinny Arsenal rept. no. TPR D-104)
Unclassified report

DESCRIPTORS: *Cartridges, Tests, Handling, High explosive ammunition, Effectiveness, Ballistics.

A number of Cartridges, 106-mm, HEP-T, M346A1 in field service storage were found to have the spacer retainer displaced, allowing the spacer to move forward on the primer tube. An engineering investigation was conducted to determine the consequences of firing cartridges with the spacer and spacer retainer at various positions, and the effect of rough-handling tests on the displacement of the spacer and spacer retainer. The results of this test apply only to rounds assembled with the type of spacer retainer shown in Figure 1. The results of the firing phase indicated that under no conditions investigated was there a dangerous pressure level developed. Spacer retainers placed at known distances forward on the primer tube moved rearward toward the base of the cartridge case upon firing. Rough-handling test revealed a displacement of the spacer and spacer retainer of 1/4 to 1/2 inch. In the event this type of retainer is displaced, neither it nor the spacer are likely to be deposited in the barrel when the round is fired. If either should be deposited in the barrel it does not appear to be dangerous to fire a round without removing them. (Author)

AD-255 461 Div. 22
(8 May 61) OTS price $6.60

Emerson Electric Mfg. Co., St. Louis, Mo.
PRE-PRODUCTION ENGINEERING STUDY OF XM 50 IMPROVED HONEST JOHN.
Final rept. 1960, 66p. incl. tables. (Rept. no. 1098)
(Contract DA 23-072-ORD-1471)
Unclassified report

DESCRIPTORS: Costs, *Rockets, Manufacturing methods, Reliability, Packaging, Military requirements, Machining, Materials, Quality control, *Artillery rockets.

A cost summary is presented for the various phases of the program. This summary reflects the authorized costs less fee, the actual costs less fee, and the resultant balance. A concise resume of the engineering effort expended is included. A detailed and comprehensive description of the funding statement, objectives, problems, and solutions for each phase of the program is presented.

AD-255 467 Div. 22, 17
(8 May 61) OTS price $2.60

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
FLOW OF COPPER BASE FILLER ALLOYS FOR WELDED OVERLAY ROTATING BANDS,
by H. W. Antes and R. E. Edelman. Mar 61, 30p. incl. illus. tables (Rept. no. R-1585)
(ORD Proj. TB4-002F and DA Proj. 5B93-32-002)
Unclassified report

DESCRIPTORS: *Rotating bands, *Copper alloys, Arc welding, Liquid metals, Fluid flow, Welds, Steel, Projectiles, Arc welds, Welding.

An arc melting apparatus was constructed to study the flow of 19 copper base alloys under simulated arc welding conditions. Arc melted deposits were made on SAE 1020 steel plates in Ar, He, and Ar-1/4% O atmospheres. Wetted area was measured from a minimum of four deposits made in a He atmosphere for each alloy. All of the alloys wet about the same amount (approximately 0.7 sq cm for a 0.6-g deposit). The wetted area depends on the heat input to the steel base material and the heat transfer in the steel. Wetting can be increased by increasing the heat input or radial heat flow in the steel base material. Radial flow of the copper deposit occurs rapidly and is limited to an area that is bounded by a critical isotherm. The location of the critical isotherm is at the extremities of the heat affected zone in the steel. This behavior was observed also for arc welded copper overlays on 30 mm shell. The presence of arc stabilizers reduces the span of the critical isotherm and thus reduces lateral flow. Surface roughness of the steel base material has little or no influence on the extent of flow. (Author)

Division 22-ORDNANCE

AD-255 513 Div. 22
(8 May 61) OTS price $3.60

Ammunition Group, Picatinny Arsenal, Dover, N. J.
BALLISTIC STABILITY STUDY OF M15 AND M17 PROPELLANTS,
by Richard E. Ehrgott. Apr 61, 16p. tables.
(Rept. no. DR-TR:1-61)
(Proj. no. TB5-21)
Unclassified report

DESCRIPTORS: *Propellants, Deterioration, Ballistics, Storage, Chemical analysis, Guanidines, Nitro radicals, Temperature, Stability, Tests.

Standard nitroguanidine propellants (M15 and M17) perform satisfactorily with respect to ballistic and chemical stability during two-year storage at 122 F and are considered suitable for field use over extended periods. (Author)

AD-255 573 Div. 22
(12 May 61) OTS price $1.60

Magnavox Co., Urbana, Ill.
MINIATURIZED SPHERICAL PELLET INTEGRATING ACCELEROMETER,
by L. R. Ransom and J. Deyo. Monthly progress rept. no. 8, 1-31 Jan 61. 31 Jan 61, 18p. incl. illus.
(Contract DA 11-022-ORD-3413, Proj. TN2-8106)
Unclassified report

DESCRIPTORS: *Accelerometers, *Integrators, Pellets, Switching circuits, *Miniature electrical equipment, Design, Monitors, *Arming devices, Tests, Spheres.

AD-255 668 Div. 22
(12 May 61) OTS price $1.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
THE DEVELOPMENT OF THE LINED HOLLOW CHARGE,
by Rudolf Thomanek, trans. by Alex Palinkas. Mar 61, 10p. incl. illus. (Technical notes no. FRL TN 27).
Unclassified report

Trans. from Explosivstoffe 8: Aug 60.

DESCRIPTORS: *Shaped charges, Cratering, *Cavity liners, Metal plates, Penetration, Germany, Antitank ammunition, Projectiles, Armor piercing ammunition, Explosives, Design.

The discovery of the lining effect and the development of the lined hollow (shaped) charge are described. While performing experiments designed to increase the kinetic energy of gas clouds entering the cavity of a hollowed explosive charge, a glass cavity liner was used to facilitate evacuation of the cavity. Deeper penetrations of a Silumin test block were obtained with the glass liner. This effect was initially attributed to the vacuum, but further testing indicated that the vacuum had no measurable influence and that the glass liner was responsible. A secret patent (no. 188/43, dated 9 December 1939) was obtained for an explosive projectile, in whose explosive charge a cavity was formed to increase the explosive effectiveness and which was characterized by a lining of the cavity.

AD-255 723 Div. 22, 7, 8
(12 May 61) OTS price $5.60.

Naval Ordnance Lab., White Oak, Md.
A RADIO-FREQUENCY BURST SOURCE FOR ELECTRO-EXPLOSIVE DEVICE TESTING,
by Louis A. Rosenthal. 27 Jan 61, 26p. incl. illus.
(NAVWEPS rept. no. 7354) Unclassified report

DESCRIPTORS: *Radiofrequency pulses, Design, Theory, *Electric detonators, Sensitivity, *Electric igniters, Pulse generators, Test equipment, Resistance, Mathematical analysis, Radiofrequency generators, Hazards, Radiofrequency oscillators, Electromagnetic waves.

The principles and design of a 5 megacycle burst source for electro-explosive device testing are developed. The source is capable of delivering 100-watt power bursts for pulse widths of 100 to 11,000 microseconds. The application to firing studies and techniques for evaluating observed traces are presented. (Author)

AD-255 772 Div. 22, 9
(11 May 61) OTS price $5.60

Ballistic Research Lab., Aberdeen Proving Ground, Md.
HYPERVELOCITY IMPACT STUDIES IN WAX,
by J. T. Frasier. Feb 61, 53p. incl. illus. tables (BRL rept. no. 1124)
Unclassified report

DESCRIPTORS: *Impact shock, *Cratering, *Waxes, Tests, Measurement, Shock waves, Propagation, Determination, Velocity, Hydrodynamics, Deformation, Elasticity, Plasticity, Pellets, Lead, Terminal ballistics.

Up to impact velocities of 5 km/sec, the limit of the present tests, the cratering of wax is not significantly different from that of lead. For both materials, the dependence of crater depth, diameter, volume, and area of impact velocity, energy, and momentum is similar. Observation of the behavior of wax targets during the impact process can yield pertinent information on the behavior of some metal targets. The technique of monitoring the emf generated by imbedded wires in the target placed in a strong magnetic field appears reliable for measuring the velocity of propagation of the pressure pulse and the associated particle velocity. At lower pressures, the observed slope of the Hugoniot agrees well with the theoretically predicted value for the elastic regime. At higher pressures, the observed Hugoniot is in fair agreement with extrapolated Hugoniot for paraffin obtained at Los Alamos by explosive technique and, hence, at much higher pressures. (Author)

AD-255 810 Div. 22
(10 May 61) OTS price $1.60

Aberdeen Proving Ground, Md.
FURTHER INVESTIGATION OF TANK GUN INACCURACIES,
by D. Paulus. May 61, 18p. incl. illus. table.
(Rept. no. DPS-140)
9proj. 572-01-001) Unclassified report

DESCRIPTORS: *Guns, *Terminal ballistics, *Interior ballistics, *Armored vehicles, *Armor piercing ammunition, Projectiles, Tanks, Ballistics, Obturation, Tests, Velocity, Pressure, Gun barrels, Errors, High speed photography, Reliability, Yaw.

Tests were conducted to determine if an obturator which had effectively improved the accuracy performance of a high-dispersion gun tube would affect the accuracy performance of a low-dispersion gun tube. A total of 119 rounds of 90-mm, APT, T33E7 shot were fired. Included were 40 test rounds, 20 obturated and 20 standard (unobturated). The accuracy performance was not significantly affected although the obturated rounds impacted considerably higher than the unobturated rounds. It is recommended that limited firings be conducted using obturated and unobturated rounds fired at equal velocities rather than at equal propellant charges. This will help to determine if the higher impacts are due to greater gun jump, caused by the higher velocities of the obturated rounds. (Author)

AD-255 811 Div. 22
(10 May 61) OTS price $8.10

Aberdeen Proving Ground, Md.
ENGINEERING EVALUATION OF CARTRIDGE, HE, T376E1 FOR 81-mm MORTAR,
by V. H. McCoy. May 61, 1v. incl. tables. (Rept. no. DPS-195)
(Frankford Arsenal TPR no. FA-IEP-213-1)
Unclassified report

DESCRIPTORS: *Projectiles, *Mortars, *Mortar shells, Exterior ballistics, Design, Interior ballistics, Stresses, Safety, Radiography, Ultrasonics, Quality control, Ammunition, High explosive ammunition, Cartridges, Ballistics, Tests, Non-destructive testing.

During production engineering of the 81-mm, HE, T376 mortar shell it was found necessary to alter the design by increasing the wall thickness of boat-tail section. The resulting modified T376 shell was designated the T376E1. For the subject test, the T376E1 shell, assembled as Cartridge, HE T376E1, was fired for security of metal parts, safety, and for ballistic match with the standard HE, M362 cartridge. Results of the tests indicate that the T376E1 shell is sufficiently strong and safe to withstand firing stresses and that a ballistic match does exist between cartridges with the M362 and T376E1 shell. It is recommended that the 81-mm, HE, T376E1 shell be considered for inclusion in the improved family of ammunition for the 81-mm mortar when assembled as Cartridge, HE, T376E1. (Author)

AD-255 812 Div. 22, 3
(10 May 61) OTS price $3.60

Aberdeen Proving Ground, Md.
BALLISTIC COMPARISON OF SHELL, 76-MM, WP-T, T140E4, WITHOUT TRACER, AND SHELL, 76-MM, HE, M352,
by R. P. Angstadt. May 61, 1v. incl. illus. tables. (Rept. no. DPA-199)
Unclassified report

DESCRIPTORS: *Smoke projectiles, Range, *Propelling charges, Exterior ballistics, Ammunition, White phosphorus, Projectiles, Ballistics, Range tables, Stability, Tests, Safety, High explosive ammunition.

The purpose of this test was to establish a charge for the Shell, 76-mm, WP-T, T140E4 (14.72-lb), without tracer, and to determine if a ballistic match exists between this round and 15.6-lb, HE, M352 shell. Test phases included charge establishment, range and safety, and accuracy and time of flight. Range tables prepared for the HE, M352 round may be used for the shell WP-T, T140E4, (without tracer). It should be noted, however, that since the WP round now weighs 0.28 lb less than the HE round, the WP round (without tracer) may yield somewhat shorter ranges than the table would indicate. If either round is modified, additional testing should be conducted. (Author)

AD-255 814 Div. 22
(12 May 61) OTS price $1.60

Aberdeen Proving Ground, Md.
PRELIMINARY TEST OF SPIRAL-WRAPPED CARTRIDGE CASE, XM148B1E1, FOR 105-mm GUN, M68,
by W. J. Rieden. May 61, 16p. incl. illus. tables (Rept. no. DPS-219)
(Proj. 504-03-089)
Unclassified report

DESCRIPTORS: Ammunition, *Cartridge cases, Cartridges, High explosive ammunition, Fin stabilized ammunition, Antitank ammunition, Interior ballistics, Projectiles, Guns, Ballistics.

The XM148B1E1 spiral-wrapped cartridge case is intended to ultimately match, and be used in place of, the brass XM148 case now used with the fin-stabilized T384, HEAT round. This spiral-wrapped case is a three-piece assembly in which the spiral-wrapped body is held to the base section by an internal collar which is bolted to the base. Two slightly different designs, arbitrarily identified as types A and B, were tested. Twenty-three cases were tested in all, 12 of type A and 11 of type B. The cases were tested up to pressures of 61,500 psi (T20 gage) and at conditioning temperatures of 125, 70, and -25 F. The most significant defect observed was the failure of eight of each type case to completely eject. All these cases were hand-free, however. Other minor defects such as internal and external fluting, and partial internal unwrapping were also observed. No cracks or splits were found in any of the fired cases. It is concluded that adaptation of the spiral-wrapped case to the 105-mm, M68 system is feasible. It is recommended that modifications to the XM148B1E1 case be made with the primary aim of improving ejection characteristics and with the secondary aim of eliminating other minor defects referred to. (Author)

AD-255 815 Div. 22
(10 May 61) OTS price $4.60

Aberdeen Proving Ground, Md.
EVALUATION TEST OF HOWITZER, 105-MM, M2A1L, GERMAN,
by A. P. Long. May 61, 1v. incl. illus. table. (Rept. no. DPS-221)
Unclassified report

DESCRIPTORS: *Howitzers, Guns, Tests, Blast, Pressure, *Recoil mechanisms, Stability, Measurement, Operation, Velocity, Germany, *Interior ballistics, Gun barrels, Equilibrators, *Gun mounts.

An evaluation test of Howitzer, 105-mm, M2A1L, German was conducted to determine the compatibility of the German-made howitzer on the US carriage Inspections, shop tests and firing tests were performed and data were obtained. It is recommended that the subject howitzer undergo further development to improve equilibration and carriage stability. (Author)

AD-255 819 Div. 22, 9
(10 May 61) OTS price $4.60

Carnegie Inst. of Tech., Pittsburgh, Pa.
FUNDAMENTALS OF SHAPED CHARGES,
by Emerson M. Pugh and George M. Bryan. Quarterly progress rept. no. 22 on Cratering of Lead by Oblique Impacts of Hypervelocity Steel Pellets. 30 Apr 61, 14p. incl. illus. table, 15 refs.
(Contract DA 36-061-ORD-513, Projs. 5B03-04-009 and TB3-0134)
Unclassified report

DESCRIPTORS: *Shaped charges, *Cratering, *Terminal ballistics, Lead, Steel, Jets, Pellets, Penetration, Metal plates, Hypervelocity projectiles, Impact shock, Explosives, Projectiles, Fluid flow, Volume, Energy.

The volume and shape of craters produced in lead by the impact of steel pellets at 3 km/sec have been studied as functions of the angle of incidence for angles up to 70 degrees from the normal. It is found that crater volume is linear in the cosine of the angle of incidence and that it is directly proportional to the kinetic energy of the pellet for a given angle of incidence. Consideration of energy and momentum conservation leads to a plausible interpretation of this behavior. It is also found that the relation between the depth and the (transverse) diameter is consistent with the concept of a radial afterflow superimposed on a primary penetration which obeys the density law of penetration by fluid jets. (Author)

AD-255 948 Div. 22
(15 May 61) OTS price $2.60

Lake City Arsenal, Independence, Mo.
PRODUCT IMPROVEMENT OF PROTECTIVE COATING ON STEEL CASES,
by Erick M. Myhre. Mar 61, 27p. incl. illus. tables (IED rept. no. 61-2)
(Proj. OAC56-239)
Unclassified report

DESCRIPTORS: *Cartridge cases, Steel, *Coatings, *Varnishes, Cartridges, Tests, Effectiveness, Abrasion, Corrosion, Guns, Substitutes, Ammunition, Firing mechanisms.

The purpose of this project was to evaluate varnish as a coating for the 20-mm steel case (M103B1) in lieu of zinc plate, in order to eliminate problems connected with zinc pick-up on the face of the M39 Gun firing pin assembly. Firing tests were conducted at three government facilities to determine the effects of the varnish-coated M103B1 Case on the performance of M39 and M61 Guns, and to evaluate the varnish coating for resistance to abrasion and corrosion. A total of 30,227 rounds were fired. Because of the conflicting results obtained at the different test facilities, further work will be required to establish the superiority of varnish over zinc plating in this application. Considerable difficulty was also encountered in applying the varnish coating to the interior surface of the case. (Author)

AD-255 971 Div. 22
(15 May 61) OTS price $4.60

Midwest Research Inst., Kansas City, Mo.
THEORETICAL AND EXPERIMENTAL STUDIES OF THE TWO-STAGE TECHNIQUE IN A CLOSED BREECH 20 MM SYSTEM,
by Andrew D. St. John and Roger J. Schroeder. Final rept. 15 June 60-30 Apr 61. 5 May 61, 44p. incl. illus. tables.
(Contract DA 23-072-ORD-1579)
Unclassified report

DESCRIPTORS: *Guns, Gun barrels, Ignition, Tests, *Interior ballistics, *Projectiles, Velocity, Friction, Instrumentation, Seals, Design, Propellant grains.

The theoretical studies and analog simulation indicate that an increase in muzzle velocity of approximately 10 per cent over conventional ballistic cycles may be expected from the two-stage ballistic cycle. The present projectile design does not allow this increase to be realized in test firings, due to pre-ignition of the second stage. The important parameters of the two-stage cycle are: first-stage loading (held constant in all tests), second-stage loading, piston weight, peak pressures, and distance to second-stage ignition. The muzzle velocity increases with increased loadings and peak pressures. Muzzle velocity increases with decreasing piston weight. A practical maximum muzzle velocity is reached when the travel to second-stage ignition is 22 in. The two-stage ballistic cycle requires a longer barrel than conventional guns. The length of 122 in. used in the test gun is satisfactory for the loadings studied. (Author)

23. PERSONNEL AND TRAINING

AD-255 292 Div. 23, 1, 28
(5 May 61) OTS price $1.10

Naval School of Aviation Medicine, Pensacola, Fla.
AN EVALUATION OF A DEVICE DESIGNED TO TEACH THE PRINCIPLES OF TRIMMING AN AIRCRAFT,
by J. H. Johnson. 25 Jan 61. 9p. incl. illus. tables. (Special rept. no. 61-1)
Unclassified report

DESCRIPTORS: *Training, *Training devices, Flight simulators, Transfer of training, Design, Effectiveness.

During the first week of primary training, a group (experimental group) of students received special training with a device designed to teach the principles of trimming an aircraft. They were compared with a matched group (control group) who received no special training. The experimental group were able to learn to manipulate the device at a rapid rate with very few errors. There was no one particular outstanding difference in performance between the experimental group and the control group. However, more of the differences that did occur were favorable to the experimental group. This was especially true of students with high aptitude. There was much more variability of performance later on in the training program among the experimental group. It may be, therefore, that the training device makes possible quicker recognition of the potential of students. (Author)

AD-255 684 Div. 23
(9 May 61) OTS price $4.60

Electric Boat Div., General Dynamics Corp., Groton, Conn.
TRANSFER RETENTION FOR VERBAL AND MOTOR TASKS,

by Donald A. Goldstein and William J. King. Technical rept. 1 Apr 61. 1v. incl. illus. tables, 12 refs. (Rept. no. U411-61-064) (Contract Nonr-307500)

Unclassified report

DESCRIPTORS: Verbal behavior, *Memory, *Learning, Training, *Transfer of training, Tracking, Analysis of variance, Training devices, Test methods.

The purpose of the experiment described in this report was to compare Transfer Retention (TR), both positive (+) and negative (-), with Regular Retention (RR) over a range of no-practice intervals using both verbal-learning and continuous-tracking tasks. The experimental design, identical for both tasks, was a 3x6 factorial employing three levels of training task similarity: RR, TR, and +-TR conditions, and six no-practice intervals: 10 min., 2 hr, 1 day, 1 wk, 1 mo, and 4 mo. With two replications within each cell, the total number of subjects employed for both tasks was 72. Each subject served individually for two sessions: a training session and a retention (test) session. The results obtained for the verbal task indicated that changing either the stimulus or the response aspects of a discrete task, treated as a unit, will show low transfer effects relative to a control group and that these differences will persist over time. The results obtained for the motor task indicated that the characteristics of the stimulus inputs during training can be different from those occurring in the operational task system, but the response components should be kept compatible with those actually required. The data also show that the decremental effects of making changes, either in the stimulus or response aspects of a motor task, decrease as a function of the length of the no-practice interval intervening between original training and operational task assignment. (Author)

AD-255 917 Div. 23, 1
(15 May 61) OTS price $2.00

Behavioral Sciences Lab., Aerospace Medical Div., Wright-Patterson Air Force Base, Ohio.
SURVEY OF ESCAPE TRAINING IN THE AIR FORCE,
by Michael Beer, Robert M. Jayson and others. Rept. on Biophysics of Flight. Mar 61, 71p. incl. tables. (Proj. 7222) (WADD TR 60-792)

Unclassified report

DESCRIPTORS: *Military training, Ejection, *Bailout, Air Force research, Air ejectors, Training devices, Aviation personnel, Ejection seats, Acceptability, Flight simulators.

The present state of the Air Force ejection training was studied and its contribution to the over-all ejection problem was considered. Relevant information was obtained from the literature on ejection training, training films, aircrew personnel, aircrew personnel who have ejected, accident statistics, and escape training instructors. The results showed that ejection training is inadequate in content and frequency. There is a lack of standardized regular training programs. Furthermore, training media, such as ejection seat trainers and films, leave much to be desired in both quantity and quality. Even more important, training to reduce fear of and anxiety about ejection is needed. In general, aircrew personnel know when to eject; but hesitate to take action because of an inadequate knowledge of procedures and an anxiety produced by unfamiliarity with the ejection experience. Ejection training in the Air Force is inadequate and needs to be improved. (Author)

24. PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES

AD-255 662 Div. 24, 12, 20, 25
(10 May 61) OTS price $3.60

Air Force Cambridge Research Labs., Bedford, Mass.
RADIATION STUDIES FROM NUCLEAR EMULSIONS AND METALLIC COMPONENTS RECOVERED FROM POLAR SATELLITE ORBITS,
by Herman Yagoda. Mar 61, 25p. incl. illus. tables, 50 refs. (GRD Research notes no. 54; AFCRL-285)

Unclassified report

DESCRIPTORS: Van Allen radiation belt, Solar energy, Radiochemistry, Radioactive isotopes, *Photographic emulsions, Satellite vehicles, *Orbital flight paths, Photographic analysis, *Solar flares, *Radioactivity, *Cosmic rays.

This study discusses two blocks of Ilford G5 emulsions, plus metallic components, that were recovered from the polar orbiting satellites, Discoverer XVII and XVIII. This discussion covers the Class 3+ flare of 12 Nov 1960 in relation to the Discoverer XVII exposure; photographic processing of satellite-exposed emulsions; preliminary cosmic-ray observations on orbited emulsions; and radiochemical analyses of the Discoverer capsules. (Author)

AD-255 813 Div. 24, 2
(15 May 61) OTS price $4.60

RCA Service Co., Inc., Patrick Air Force Base, Fla.
RESULTS IN GEODETIC PHOTOGRAMMETRY II. A STUDY OF THE FEASIBILITY OF A PHOTOGRAMMATIC SURVEY OF AMR TO AN ACCURACY OF 1 PART PER MILLION,
by Duane C. Brown. 15 Sep 60, 45p. incl. illus. tables. (RCA data processing technical rept. no. 65)
(Subcontract to Pan American World Airways, Inc., New York, Contract AF 08(606)3413) (AFMTC TR 61-2)

Unclassified report

DESCRIPTORS: *Mapping, *Radar tracking, *Aerial photography, Photographic analysis, Photography, Tracking, Geodetic data, Position finding, Ballistic cameras.

For the survey of the final MISTRAM system it will be necessary to develop a camera of at least 1200 mm focal length and at least 300 mm aperture and having a field of view of nominally 10 x 10 degrees. The foremost consideration in the design of the camera should be its intended application in extensive photogrammetric flare triangulation. In order to insure that it be possible to achieve an effective directional accuracy per plate of 1 part in 10 to the sixth power through the averaging of multiple flashes, the basic criterion for the evaluation of metric performance is necessarily that the bias introduced by the system, and in particular the camera, should not exceed the equivalent of one micron on the plate. This capability can be tested under a variety of conditions by a special series of stellar exposures. The camera and systems design to be sought is the simplest which will provide the required metric and operational performance. (Author)

25. PHYSICS

AD-255 005 Div. 25
(1 May 61) OTS price $1.60

Trieste U. (Italy).
ON A POSSIBLE ENHANCEMENT OF RELATIVISTIC INCREASE IN IONIZATION,
by P. Budini, L. Taffara, and C. Viola. 15 Dec 60, 10p. illus. (Scientific note no. 2)
(Contract AF 61(052)211)
(AFOSR-508) Unclassified report

DESCRIPTORS: *Ionization, *Cerenkov radiation, Ions, Hydrogen, Helium, Alcohols, Theory, Mixtures, Mathematical analysis, Detection, Particles.

Theoretical analysis indicates that reabsorption of Cerenkov radiation in special mixtures of elements with different ionization potentials should give an appreciable enhancement of relativistic increase of primary ionization. Mixtures of H + He and He + alcohol are discussed. It would be useful to prove experimentally the existence of such an effect for its potential application in high energy physics, i.e., particle detection.

AD-255 047 Div. 25
(5 May 61) OTS price $1.10

Bristol U. (Gt. Brit.).
AN INVESTIGATION OF CRYSTAL IMPERFECTIONS BY X-RAY DIFFRACTION,
by Andrew R. Lang. Status rept. no. 2, 1 Dec 60-28 Feb 61. Mar 61. 6p.
(Contract AF 61(052)449)
Unclassified report

DESCRIPTORS: *Crystals, *X-ray diffraction analysis, Lattices, Electron transitions, *Silicon, *Indium compounds, Antimonides, Diffraction, Thermal stresses, *Germanium, Lithium compounds, Fluorides, Deformation, Growth.

All sections of the Si crystal showed a complex history of dislocation movement. Dislocation densities varied with distance from the crystal seed from 1000 to 100,000 lines/sq. cm. Interference of dislocations belonging to 2 or more slip systems gives rise to tangles. Several other reactions between individual dislocations were analyzed. X-ray topographs were made of Ge crystals in the form of tapering wedges to study (1) the contrast of images as a function of thickness, (2) the modulation of intensity of diffracted beams as a function of thickness, and (3) the effect of surface irregularities. Crystals of InSb were examined with dislocation densities ranging from about zero to 10,000 lines sq/cm. Progress is reported in heat-treating, etching, and handling of LiF. X-ray topographs of quartz show localized regions of enhanced reflecting power. Work was continued on extending and developing a basic theory of refraction of energy flow and a new approach to the diffraction theory of a distorted crystal.

AD-255 062 Div. 25
(2 May 61) OTS price $5.60

Ball Brothers Research Corp., Boulder, Colo.
IRRADIATION MEASUREMENTS OF THE EARTH'S ATMOSPHERE IN THE 5- TO 40-MICRON SPECTRAL REGION AT HIGH ALTITUDES,
by R. T. Ekrem, D. L. Fain and others. Final rept. Mar 61. 49p. incl. illus. (Rept. no. SR61-2)
(Contract AF 19(604)5564)
Unclassified report

DESCRIPTORS: *Atmosphere, *Infrared radiation, Absorption, Experimental data, Spectrographic data, Instrumentation, Measurement, Data storage systems, Telemetering, Balloons.

The information obtained from the two experimental flights was inaccurate in respect to energy measurement and lacked sufficient spectral resolution to show the emission and absorption characteristics of the atmosphere. The lack of data quality was caused by system errors, environmental conditions, launching shock, and interfering signals. These first flights show the changes that would be necessary to obtain useful data with balloon-borne spectrographic equipment. Photometric means of energy measurement in the infrared are extremely difficult to accomplish accurately. Greater precision and ease of measurement will be achieved if this method is discarded in favor of more direct measurement techniques using a fixed temperature comparator. Simplification of the spectrometer will also help to eliminate many problems. Careful attention to the mating of data storage and/or telemetry equipment will reduce interfering signals and a program of environmental testing of all equipment will insure more reliable results. (Author)

AD-255 066 Div. 25, 2
(2 May 61) OTS price $1.60

High Altitude Observatory, Boulder, Colo.
IDEALIZED PROBLEMS OF PLASMA DYNAMICS RELATING TO GEOMAGNETIC STORMS,
by Sydney Chapman. 4 Apr 61, 15p. incl. illus. tables (Scientific rept. no. 30)
(Contract AF 19(604)2140; In cooperation with Institute of Science and Technology, U. of Michigan, Ann Arbor)
(AFCRL-291) Unclassified report

Reprint from Reviews of Modern Physics 32:919-933, Oct 60. (Copies also available from ASTIA)

Paper read at IUTAM Symposium, Williamsburg, Va. and Washington, D. C.

DESCRIPTORS: Terrestrial magnetism, *Magnetic storms, Geophysics, *Plasma physics, Solar flares, Electrons, Protons, *Magnetohydrodynamics.

Contents:
Solar plasma streams and magnetic storms
Energetic electrons and protons
Hydromagnetics and hydromagnetic inferences
Hydromagnetics and plasma kinetics
Problems of uniform motion through a uniform field
Approach of a solar stream into the geomagnetic field
Cylindrical sheet problem
Oblique projection
Extension to a volume distribution and plasma
Advance of a solar stream into a plane model magnetic field
Thermal and other relative motions of the particles
Collisions between the particles
Further idealized plasma problems
Velocity distribution function

AD-255 082 Div. 25, 2
(2 May 61) OTS price $6.60

Marine Physical Lab., U. of Calif., San Diego.
THE DIRECTIONAL DISTRIBUTION OF AMBIENT NOISE IN THE OCEAN,

by Bradford Albert Becken. 7 Mar 61, 1v. incl. illus. tables (SIO ref. no. 61-4)
(Contract Nonr-221605)
Unclassified report

DESCRIPTORS: *Underwater sound transmission, *Underwater sound, *Noise, Sound, Ocean waves, Acoustics, *Propagation, Ocean bottom, *Oceans, Hydrophones.

Anisotrophy of deep ocean ambient noise in the frequency range of 750 to 1500 C was investigated, vertical and azimuthal dependencies were isolated, the identity of sources contributing to nonuniform distributions was established, and the radiation patterns of such sources were inferred. Deep ocean ambient noise was anisotropic at sea states above zero. The surface of the ocean was a major contributor to nonuniform distributions and the radiation patterns of such surface sources were deduced. Vertical anisotrophy was attributed to the superposition of a noise field due to the radiating ocean surface upon an isotropic field present in the absence of surface radiation. The intensity, at a receiver due to a unit incremental surface radiator of intensity, at one yard, can be considered as the intensity due to direct transmission or specular bottom reflection with attenuation due to spherical spreading and absorption occurring over the separation between radiator and receiver. (Author)

AD-255 085 Div. 25, 14
(8 May 61) OTS price $1.10.

Cincinnati U., Ohio.
THERMODYNAMIC INVESTIGATION OF CERAMIC MATERIALS AT ELEVATED TEMPERATURES,
by Michael Hoch. Quarterly rept. 15 Dec 60-15 Mar 61. 21 Apr 61, 4p. tables.
(Contract AF 33(616)6299, Proj. 7021)
Unclassified report

DESCRIPTORS: *Ceramic materials, Phase studies, *Thermodynamics, *Refractory materials, Lattices, Thermochemistry, Titanium compounds, Zirconium compounds, Niobium compounds, Tantalum compounds, Chromium compounds, Boron compounds, Oxides, Phosphides, Chemical reactions, Stability,

Electromotive forces from the change of partial free energy of O in TiO varied from 100 to 5 mv after 4 hr at 1375 K. Fairly constant values of electromotive force were obtained for the reaction of 2 Zr + ZrO2 + 3 ZrCr2 equals 2 Zr3Cr3O(18 mv at 1510K and 21 mv at 1550K). The half cells were Zr/ZrO2 and Zr2/Zr/Zr3Cr3O. All the transition metals (Ta, V, Nb, Mo, Cr, and W) stabilize c-ZrO2 with TiO2 and another metal. Nb2O5 and Ta2O5 were substituted for TiO2 in 2 experiments; no c-ZrO2 was formed. Similar compounds (6ZrO2.Nb2O5 and 6ZrO2.Ta2O5) were formed in each experiment and the d values in the 2 structures coincided; some reduction occurred with the Nb2O5 but not with Ta2O5. After heating for 4 hr at 1200 C, Zr2Cr2O is present in large quantities when prepared with Cr, Zr, and Cr2O3 or Cr, Zr, and ZrO2. High purity boron phosphide, prepared from BCl3 and PH3 and degassed at 1200 K to constant weight, had a smaller residue than that stoichiometrically calculated for the expected end product, BP.

AD-255 093 Div. 25
(2 May 61) OTS price $4.60

General Electric Co., Schenectady, N. Y.
INVESTIGATION TO ESTABLISH HOW IMPURITY ATOMS AFFECT CRYSTAL NUCLEATION,
by G. W. Sears. Final rept. Apr 61. 37p. incl. illus. table, 35 refs. (Rept. no. 61-GC-164)
(Contract AF 19(604)5505)
(AFCRL TR 60-351) Unclassified report

DESCRIPTORS: *Crystals, Growth, *Crystal structure, Chemical impurities, Solutions, Iron compounds, *Fluorides, *Lithium compounds, Deformation, Lattices.

The theory of preferential etching at dislocations has been presented by Cabrera (Phil. Trans. Roy. Soc. London. Ser. A. 243:299, 1951). In Part I of this report the theory is reviewed and compared to empirical observations on the dissolution of lithium fluoride. The observed dissolution behavior is consistent with Cabrera's theory as modified by the effect of dissolution poisons. The presence of a few parts per million of step poisons strongly alters both crystal growth and dissolution rates. It was known that a few parts per million ferric fluoride was a poison for the dissolution of lithium fluoride. In Part II of this report it is shown that ferric fluoride is also a growth poison for lithium fluoride from aqueous solution. Ferric fluoride has the properties characterizing a step poison for the lithium fluoride-water system. (Author)

AD-255 142 Div. 25
(4 May 61) OTS price $2.60

Case Inst. of Tech., Cleveland, Ohio.
PRESSURE DEPENDENCE OF THE ELASTIC SHEAR CONSTANTS OF Li,
by A. L. Jain. Technical rept. no. 5 on Solid State Physics Program. Feb 61, 20p. incl. illus. tables, 10 refs. (Technical rept. no. 5)
(Contract Nonr-114105, Proj. NR 017-444)
Unclassified report

DESCRIPTORS: *Lithium, *Shear stresses, Single crystals, Elasticity, Pressure, Temperature, Measurement, Electrostatics, Energy, Electrons, Ions.

The elastic shear constants C equals C sub 44 and C' equals 1/2 (C sub 11-C sub 12) of Li were measured as a function of pressure at room temperature. The measured values of the quantity-dln C/dln r are, C equals 4.1; and C' equals 2.8. This inequality of the two pressure variations is contrary to the situation found in Na, where the two coefficients were equal. Theoretically, the two coefficients are expected to be the same, if only the electrostatic interaction between the electrons and the ions is responsible for the elastic stiffness of the metal. The different behavior in Li can be understood in terms of the extra contribution to the shear constants arising due to the change in the Fermi energy of the electrons on shearing. (Author)

AD-255 156 Div. 25
(2 May 61) OTS price $2.60

Polytechnic Inst. of Brooklyn, N. Y.
CREEP ANALYSIS OF ANNULAR PLATES,
by B. Venkatraman and Sharad A. Patel. Mar 61, 1v. incl. illus. tables. (PIBAL rept. no. 588)
(Contract AF 49(638)302, Proj. 9782)
(AFOSR-518) Unclassified report

DESCRIPTORS: *Sheets, *Creep, Metal plates, Mathematical analysis, Moments, Plasticity, Deformation, Plastic flow, Shear stresses, Load distribution, Pressure, Stresses, Time, Elasticity, Integral equations, Equations, Differential equations, Theory.

The paper presents analyses of creep in annular plates subjected to uniform lateral pressures. These analyses are based upon creep flow laws associated with the maximum shearing stress criterion. It is assumed that the creep rate is a power function of moment multiplied by a function of time. Annular plates with four specific edge conditions are considered. These are: free inner edge and simply supported, or clamped outer edge; free outer edge and simply supported, or clamped inner edge. In all cases expressions for moments and deformations are obtained in closed form. (Author)

AD-255 157 Div. 25
(2 May 61) OTS price $2.60

Princeton U., N. J.
STABILIZATION OF ENERGY-RICH MOLECULES. II. ENERGY TRANSFER WITH PARAFFIN HYDROCARBONS,
by B. Stevens and M. Boudart. Jan 61, 24p. incl. illus. tables, 14 refs.
(Contracts AF 49(638)31 and AF 33(038)23976)
(AFOSR-158) Unclassified report

DESCRIPTORS: Naphthyl radicals, Amines, *Hydrocarbons, Vapors, *Gases, Molecules, Excitation, Energy, Stabilization, *Fluorescence, Atomic energy levels, *Reaction kinetics, Thermodynamics, *Methanes, *Ethanes, Theory, Test equipment, Measurement, Solids.

Energy transfer between vibrationally excited Beta-naphthylamine vapor and paraffin hydrocarbons from methane to hexane has been studied by measuring the enhancement of fluorescence of the aromatic molecule due to stabilizing collisions. The accommodation coefficient characterizing the efficiency of energy transfer in this type of collision increases linearly with molecular weight when the vibrational modes of the stabilizing gas participate significantly in the exchange of energy. This result was previously found in the case of thermal accommodation of paraffins at nickel surfaces. The parallelism between the two phenomena is emphasized. (Author)

AD-255 159 Div. 25
(2 May 61) OTS Price $3.60

Princeton U., N. J.
THE EFFECT OF DISSOLVED ALKALI HALIDES ON THE RAMAN SPECTRUM OF WATER,
by J. W. Schultz and D. F. Hornig. 1 Apr 61, 1v. incl. illus. tables. (Technical rept. no. 9)
(Contract Nonr-185827, Proj. NR-014-203)
Unclassified report

DESCRIPTORS: *Alkali metal compounds, *Halides, Solvent action, Water, Halogens, Ions, Chemical bonds, *Raman spectroscopy, Intensity, Solutions, Heavy water, Electrolytes, Polarization, Salts, Frequency, Spectrographic analysis, Solvates, Microspectrophotometers, Deuterium oxide.

An investigation was made of the Raman spectra of H2O, D2O and of solutions of a series of alkali halides, utilizing a photoelectric Raman Spectrograph which enabled the study of band shapes, intensities and depolarization ratios as well as frequencies. Results indicated that the solution of halogen ions strongly affected the intensity of Raman scattering from water molecules and appeared to go approximately inversely as the strength of the O-H...X- bonds, with an additional contribution due to the breakdown of the local water structure about the larger ions. On the other hand, in going from Li+ to K(+) or Cs(+) there appeared to be no effect whatever and for this there is no explanation. No evidence was found for the presence of more than one kind of water molecule. (Author)

AD-255 160 Div. 25, 4
(2 May 61) OTS price $1.60

Purdue U., Lafayette, Ind.
RARE EARTH OXIDE SYSTEMS. PART I. A COMPARISON OF THE HYSTERESIS EFFECTS IN PRASEODYMIUM OXIDE AND EVERETT'S THEORY OF HYSTERESIS,
by Paul A. Faeth and Alan F. Clifford. 17 Mar 61, 13p., 11 refs.
(Contract AF 18(603)45)
(AFOSR-549) Unclassified report

Presented in part at the 138th National Meeting of the American Chemical Society in New York City, September 1960.

DESCRIPTORS: *Rare earths, *Praseodymium compounds, *Oxides, *Hysteresis, Pressure, Theory, Microbalances, Phase studies, Measurement.

The composition-pressure diagram of the Pr-O system has been studied between 1/100,000 and 150 mm oxygen pressure using a quartz beam microbalance. The isotherms between 400 and 500 C show hysteresis between PrO1.80 and PrO1.83 as the pressure varies. At 465 C a hysteresis loop extends over the entire pressure range. Everett's theory of hysteresis is compared to the Pr-O isotherms at 465 C. The seven theorems proposed by Everett are cited and discussed with reference to the Pr-O data. In general the agreement between the properties of Everett's theoretical model of a domain system is good. The behavior of the praseodymium oxide system is thought to be a result of its being composed of domains of various stable compositions, PrO1.83, PrO1.80, etc. The domains change composition as a function of the oxygen pressure. (Author)

AD-255 167 Div. 25
(1 May 61) OTS price $1.10

Weizmann Inst. (Israel).
PROPAGATION OF AN SH-TORQUE PULSE IN A LAYERED ELASTIC HALF-SPACE.
Quarterly rept. no. 19, Jan-Mar 61. 15 Apr 61, 2p. incl. illus.
(Contract Nonr-218900)
Unclassified report

DESCRIPTORS: *Wave transmission, Elasticity, Propagation, Experimental data, Wave analysis.

AD-255 212 Div. 25
(3 May 61) OTS price $4.60

Johns Hopkins U., Baltimore, Md.
AN EXPERIMENTAL STUDY OF THE INTERRELATION BETWEEN THE THEORY OF DISLOCATIONS IN POLYCRYSTALLINE MEDIA AND FINITE AMPLITUDE WAVE PROPAGATION IN SOLIDS,
by James F. Bell. Mar 61, 27p. illus. 19 refs.
(Technical rept. no. 7)
(Contract AF 49(638)423)
(AFOSR-422) Unclassified report

DESCRIPTORS: *Crystal structure, Propagation, Wave transmission, *Single crystals, Rods, *Aluminum, *Plasticity, Deformation, Crystals, *Stresses, Impact shock, Theory, Lattices, Solids.

A detailed verification is given for the G. I. Taylor theory of dislocations in polycrystalline annealed aluminum. Applying the finite amplitude wave theory, with a theoretical parabolic stress-strain curve obtained from dislocation theory, experimental and theoretical correlations within approximately 1% were obtained for the velocities of strain propagation, maximum strain, largest distance of penetration of maximum strain, dynamic stress levels in the first diameter, time of contact, coefficient of restitution, mushrooming in the first diameter, and an energy balance before and after impact. Variations in the plastic wave development and dynamic stress behavior below the Karman critical velocity were considered in terms of a difference in the initial elastic reflection behavior below the critical velocity. Plastic deformation was independent of strain rate, even at experimentally determined values of 2000 in/in/sec. The subsequent development of dispersive plastic wave fronts following the passage of the initial shock, were also in accordance with predictions based upon dislocation theory. The equipartition of energy in the vicinity of the impact face was related to the reflection behavior of these initial shock fronts at the lateral surface of the rod. (Author)

AD-255 273 Div. 25, 17
(4 May 61) OTS Price $8.10

Materials Research Lab., U. of Calif., Berkeley.
THERMAL PROPERTIES OF INDIUM,
by Alexis I. Kaznoff (Doctoral thesis), Raymond L. Orr, and Ralph Hultgren. 1 Apr 61, 83p. incl. illus. tables, 76 refs. (Technical rept. no. 2)
(Contract Nonr-22263)
(Series no. 155, Issue no. 2) Unclassified report

DESCRIPTORS: *Indium, Thermodynamics, *Specific heat, Measurement, Physical properties, Melting, Electrical properties, Resistance, Electrical conductance, Phase transitions, Crystals, *Liquid metals, Heat transfer.

True heat capacity of high purity In (99.999+%) was measured in the interval of 350 to 800 K. The high values of this thermodynamic property near the melting point (429.2 K) had the appearance of lambda-like transitions associated with higher order changes of state. The possibility of a phase transformation, other than fusion, was ruled out on the basis of measurements of electrical resistivity, transverse and longitudinal sonic velocities, and X-ray data. The process of fusion in In was identified as a first order transition from the pressure variation of the melting point. The effect of impurities and grain size on the pre-melting phenomena were shown to be minor. The results of electrical measurements were used as a check on the existence of phase transformation and to obtain the energy of formation of vacancies in In; this was found to be 5500 calories. The sharp decrease in the high heat capacity values for indium near the melting point may indicate the break-down of clusters in the liquid. Since electrical resistivity measurements and ultrasonic measurements failed to indicate any abnormalities near the melting point, it is surmised that fractional crystallization may have occurred on the rough surface of the Mo crucible. (Author)

AD-255 299 Div. 25, 30
(4 May 61) OTS price $7.60

Southern Methodist U., Dallas, Tex.
STUDIES LEADING TO THE DEVELOPMENT OF AN ELECTROMAGNETIC DARKROOM,
by K. W. Heizer and W. W. Koepsel. Final rept. 1954. 72p. incl. illus. tables.
(Contract NOy-73242)
Unclassified report

DESCRIPTORS: *Electromagnetic waves, Measurement, Dielectrics, Absorption, *Test facilities, Test equipment, Synthesis, Reflection, Materials, *Electromagnetic wave reflections, Mathematical analysis.

The investigation concerned the development of an electromagnetic darkroom which would function as a free space chamber and allow interference-free quantitative electromagnetic radiation measurements to be made. An investigation was made concerning the construction of a single or a series of rooms having walls with a very low reflection factor over a very wide frequency spectrum (15 kc to 10 kmc). In order for the room to be effective, it was required that the reflection factor of the walls be no greater than 10% and that the transmission factor through the walls be zero. The original absorber was designed to use only lossless dielectrics. Methods were then developed that allowed loss in the dielectrics. An absorber using lossy elements was constructed and the results compared to the calculated values. (Author)

AD-255 314 Div. 25, 8, 20
(5 May 61) OTS price $6.60

Diamond Ordnance Fuze Labs., Washington, D. C.
ELECTRONIC INSTRUMENTATION FOR PROJECT 6.2, OPERATION PLUMBBOB,
by J. C. Hoadley. 5 Apr 61, 59p. incl. illus.
(DOFL rept. no. TR-886)
(Proj. 23300)
Unclassified report

DESCRIPTORS: Nuclear explosions, *Magnetic fields, Measurement, *Magnetic recording systems, Magnetic effects, *Electronic equipment, Instrumentation, Shielding, Recording systems, *Nuclear magnetic dipole moments, *Electromagnetic shielding, Radiation damage, Design, Automatic.

Magnetic component measurements were made of the near magnetic field associated with a nuclear detonation. The instrumentation design consisted of signal pick-up loops, shielded signal lines, and a self-powered shielded package containing a magnetic tape recorder and associated control circuits. The design and performance of this automatic, multichannel, wide-band magnetic tape recording system are described. (Author)

AD-255 317 Div. 25
(5 May 61) OTS price $13.00

Electronic Defense Labs., Mountain View, Calif.
FERROELECTRIC BIBLIOGRAPHY,
by Robert D. Hall. 10 Mar 61, 153p. 1611 refs.
(Technical memo. no. EDL-M351, Supersedes Technical memo. no. EDL-M165, AD-210 781)
(Contracts DA 36-039-sc-85402 and DA 36-039-sc-87475)
Unclassified report

DESCRIPTORS: *Ferroelectric crystals, *Ferroelectric materials, *Ferroelectricity, *Bibliography.

Division 25-PHYSICS

The categorization of articles by subject is arbitrary in the choice of categories, and in the assignment of articles to categories. The arrangement is intended to provide an approximate guide to the literature which the user of the bibliography may refine to fit his purpose. The format of the bibliography is improved by placing ten references on each page except for two pages where this was impossible. The format of the individual references is based on that of the American Physical Society. The order is intentionally alphabetical by author except for a short supplement of articles at the end of the text. These articles came to our attention after the earlier text had been completed. (Author)

AD-255 349 Div. 25, 12
(7 May 61) OTS price $10.50

Radio Corp. of America, Moorestown, N. J.
VALUES OF THE TRANSPORT COEFFICIENTS IN A PLASMA FOR ANY DEGREE OF IONIZATION BASED ON A MAXWELLIAN DISTRIBUTION.
Rept. on Down-Range Anti-Ballistic Measurement Program (DAMP) Apr 61, 125p. incl. illus. tables, 57 refs.
(Contract DA 36-034-ORD-3144, Proj. DEFENDER)
(ARPA rept. no. 51) Unclassified report

DESCRIPTORS: *Plasma physics, *Transport properties, Gas ionization, Ionization, Partial differential equations, *Conductivity, Mathematical analysis, Guided missile trajectories, Series, Polynomials, Shock waves, Ionosphere, Integration, Tensor analysis, Statistical functions, Matrix algebra, Guided missiles, Electrons, Equations, Radar tracking, High temperature research, Magnetic fields, *Antiaircraft defense systems.

Values are presented for the electronic conductivity for any degree of ionization, radio frequency, and dc magnetic field strength, and various electron speed power law variations of the electron collision frequency with neutral particles. Also, the other transport coefficients, such as electron current due to electron density gradients and temperature gradients, and energy flow due to an electric field and due to density gradients and temperature gradients, are tabulated. The analysis is based on substitution of the usual series expansion of Laguerre polynomials into the Fokker-Planck equation for Coulomb collisions and into the Boltzmann equation for electron collisions with neutral particles. The electron conductivity results are applied to transverse magnetic field measurements, to high temperature air (shock fronts) and to the Appleton-Hartree equation (ionosphere). (Author)

AD-255 354 Div. 25, 16, 32
(9 May 61) OTS price $10.10

Michigan U., Ann Arbor.
STUDIES OF SYLLABLE NUCLEI 2,
by Ilse Lehiste and Gordon E. Peterson. Aug 60, 122p. incl. illus. tables, 10 refs. (Rept. no. 4)
(Contract Nonr-122422, Proj. NR 049-122)
Unclassified report

DESCRIPTORS: Language, *Speech, Intelligibility, Acoustics, Spectrographic analysis, *Speech representation, Communications theory, Verbal behavior, Analysis, Theory.

This study deals with the influence of preceding and following consonants on the duration of stressed vowels and dipthongs in American English. A set of 1263 CNC words, pronounced in an identical frame by the same speaker, was analyzed spectrographically, and the influences of various classes of consonants on the duration of the nucleus were determined. The residual durational differences are analyzed as intrinsic durational characteristics, associated with each syllable nucleus. The theory is tested with a set of 30 minimal pairs of CNC words, uttered by five different speakers.

AD-255 388 Div. 25, 5, 6, 12
(4 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SEMICONDUCTORS (SELECTED PARTS),
by D. N. Nasledov. 2 Nov 60, 4p. (Trans. no. MCL-500 from Poluprovodniki:pp. 22, 23, 27, 29, 30, 42, 44, 1959)
Unclassified report

DESCRIPTORS: *Semiconductors, *Infrared detectors, Photoconductivity, Materials, *Thermal radiation, *Thermal targets, Detection, Lead compounds, Sulfides, Indium compounds, Antimonides, *Infrared target seekers, *Infrared communication systems, *Phototubes, Germanium, Sensitivity, *Infrared receivers, *Infrared photoconductors, *Triodes, Cooling, *Thermoelectricity, Modulation, *Infrared optical materials.

A discussion is presented on semiconductors with respect to infrared techniques, photoconductive materials, thermal radiation detection, photoresistors, heat seekers, infrared communications, germanium phototubes, infrared receivers, thermoelectrical triode cooling, photoresistor cooling, infrared optics, and infrared ray modulation.

AD-255 389 Div. 25, 7, 8
(4 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
A SPLINTER OF THE SUN,
by F. Nabiullin. 2 Nov 60, 7p. (Trans. no. MCL-502 from Tekhnika Molodezhi 10:18-21, 1959)
Unclassified report

DESCRIPTORS: *Solar cells, USSR, Silicon, Sun, Energy, *Electric power production, *Solar energy.

AD-255 412 Div. 25, 8
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MODULATION OF LIGHT BY SUPERHIGH FREQUENCY (10 TO THE 10TH POWER cps),
by G. S. Simkin, V. P. Naberezhnykh, and I. V. Lukin. 3 Jan 61, 10p. incl. table. (Trans. no. MCL-801 from Izmeritel'naya Tekhnika 8:41-43, Aug 60)
Unclassified report

DESCRIPTORS: *Light, *Modulation, *Modulators, USSR, Superhigh frequency, Nitrobenzenes.

Research is reported on the modulation of light by superhigh frequency. The following was concluded. (1) Nitrobenzene made it possible to modulate the light by frequency of up to 10 to the 10th power cycles, (2) relaxation time of nitrobenzene molecules is comparable in value with the time obtained from the dispersion of

electromagnetic waves of the same frequency, (3) modulation depth can be increased by a better selection of the cell size and structure, increasing the power of superhigh-frequency pulse oscillator and by the proper cooling of the cell during its operation, and (4) the applied method for determining the relaxation time of nitrobenzene can be employed also to determine the relaxation time of other substances.

AD-255 415 Div. 25, 2
(4 May 61) OTS price $1.60.

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
STUDY OF ATMOSPHERIC ELECTRICITY ON THE EL'BRUS MOUNTAIN (Issledovaniya Atmosfernogo Elektrichestva Na El'Bruse)
by I. B. Pudovkina. Oct 60, 10p. incl. table. (Trans. no. F-TS-9947/III from Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya 3:288-292, 1954)
Unclassified report

DESCRIPTORS: *Atmospheric electricity, USSR, *Electric discharges, Clouds, Precipitation, Diurnal variation, Electric potential, Measurement,

An account is given of the results obtained by the 1951 El'brus Mountain expedition for the study of atmospheric electricity. The expedition obtained normal values of elements of atmospheric electricity measured at the High Mountain Observatory EL'BRUS as well as certain data pertaining to the nature of electric field perturbations (disturbances) caused by the clouds, and observed during precipitations. (Author)

AD-255 421 Div. 25, 14, 30
(8 May 61) OTS price $4.60

Armour Research Foundation, Chicago, Ill.
PHOTOELASTIC STRESS ANALYSIS OF A PRESSURE VESSEL,
by W. F. Riley and A. J. Durelli. Phase rept. no. 1, 1 July 60-1 Mar 61. 14 Apr 61, 42p. incl. illus. (Rept. no. ARF 8204-10)
(Contract DA 11-022-503-ORD-3469)
Unclassified report

DESCRIPTORS: *Pressure vessels, *Stresses, *Photoelasticity, Mathematical analysis, Load distribution, Epoxy resins, Plastics, Test methods.

A study was conducted to determine the magnitude and location of governing stresses in a pressure vessel. The stress determinations were made by using conventional three-dimensional photoelasticity techniques on a 0.533 scale model manufactured from a material known as Hysol 6000-OP. The loading applied to the model was internal pressure. The results of the investigation indicate that 4 regions of high stress exist in the pressure vessel. In the undercut radius at the base of the closed end cylinder, a maximum stress of 4.75 times the internal pressure was found. In the thread relief grooves in the coupling, stresses as high as 5.60 times the internal pressure were found. The other two regions of high stress occur in the small fillets at the bottom of the keyway in the tube, and in the small fillets at the roots of the sectored threads. The maximum stresses in these regions were 6.45 and 8.5 times the internal pressure, respectively. In the fillets of the sectored threads in all slices studied the highest stresses were found either at the first or the last full thread. The stresses in the fillets of the intermediate threads were in general considerably less than the maximum stress in the slice. (Author)

AD-255 431 Div. 25
(17 May 61) OTS price $1.60

University of Southern Calif., Los Angeles.
OPTICAL CONSTANTS OF GERMANIUM IN THE REGION 0-27 EV,
by Om P. Rustgi, J. S. Nodvik, and G. L. Weissler. Technical rept. on Interactions of Vacuum Ultraviolet Radiation with Solids. 21 Oct 60, rev. 13 Feb 61. 16p. incl. illus. table, 15 refs. (Contract DA 04-495-ORD-1801)
(OOR rept. no. 1722:4) Unclassified report

DESCRIPTORS: *Germanium, *Optics, Solids, Ultraviolet radiation, Reflection, *Crystals, Transmission, Thin films, *Refractive index, Measurement, Determination, Plasma physics, Frequency, Electrons, Energy, *Electron optics.

The reflectivity has been measured for Ge crystal over the energy range 7.6 - 18.0 ev and the transmissivity for an evaporated Ge film over the range 16.6 - 27.4 ev. The reflectivity data near normal incidence, combined with existing data at lower energies, were used in the Kramers-Kronig dispersion relation to evaluate the index of refraction and extinction coefficient of Ge over the range 0 - 18 ev. Electron characteristic losses are predicted at 10 and 15 ev, consistent with those observed at 11 and 16 ev. The plasma frequency of bulk Ge as determined by the optical data is 10 ev. (Author)

AD-255 465 Div. 25, 20
(7 May 61) OTS price $1.60.

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
A STUDY OF THE EFFECT OF GAMMA IRRADIATION ON THIN METALLIC FILMS,
by A. Boornard, J. Steinberg, and D. B. Rosenblatt. Oct 60, 11p. incl. table, 11 refs. (Technical memo. M61-9-1)
(ORD Proj. TB2-0001 and DA Proj. 5B99-01-004; In cooperation with RCA Labs., Camden, N. J. and RCA Labs., Moorestown, N. J.)
Unclassified report

DESCRIPTORS: *Thin films, *Metal films, Films, Copper, Gold, Glass, Gamma rays, Steel, *Radiation damage, Resistance, Solid state physics, Electrical properties, Crystal structure, X-ray diffraction analysis,

A study was made to investigate radiation effects in thin metallic films prepared by the vacuum evaporation process. Copper and gold films were deposited in vacuum by the thermal evaporation process on soft glass and stainless steel substrates and irradiated at Brookhaven National Laboratory at room temperature by Cobalt 60 gamma rays. The electrical resistivity was measured and X-ray diffraction patterns were obtained before and after irradiation of the samples on the glass substrates. Broadening of the X-ray diffraction patterns occurred upon irradiation of the samples on glass, but not on metal substrates. Resistivity changes were observed, but were not correlated with this line broadening. (Author)

AD-255 466 Div. 25, 15
(7 May 61) OTS price $1.10

Frankford Arsenal, Philadelphia, Pa.
AN ANALYSIS OF THE CURVES DESCRIBING DECAY PHENOMENA,
by J. Steinberg and F. Rothwarf. Mar 61, 8p. incl. illus. table (Technical memo. no. M61-23-1)
(ORD Proj. TS4-4024 and DA Proj. 502-01-008)
Unclassified report

DESCRIPTORS: Solids, *Solid state physics, *Differential equations, Solutions, Mathematics, Phosphorescence.

A study was made to determine the equations of analytic curves that closely match the experimental curves obtained upon measurements of decay processes. A method is described for matching experimental decay curves. The curve is assumed to be a solution to a particular differential equation dx/dt equals the product of -A and x to the power of k and the values of k and A are determined in a unique manner from the experimental data. The plot of this equation, with the values of k and A so determined, yields a curve that matches the experimental curve very closely. The method will be generally useful to others who encounter this type of problem. (Author)

AD-255 506 Div. 25
(16 May 61) OTS price $1.60

Northwestern U., Evanston, Ill.
THEORY OF CONTINUOUS DISLOCATION AND ITS APPLICATION,
by Toshio Mura. 11 Apr 61, 15p. incl. illus.
(Contract AF 49(638)780)
(AFOSR-581) Unclassified report

DESCRIPTORS: *Deformation, Plasticity, Crystal structure, *Lattices, *Metallic crystals, Theory, Mathematical analysis, Integration, Crystals, Mechanical properties, Electromagnetic fields.

A new theory of the continuous dislocation is proposed by introducing the ideas that the stored energy of the continuous dislocation and the kinetic energy can be expressed by deformation tensors and their time derivatives as a natural extension of concepts in the classical theory of dislocations. The slip process in plastic deformation, Frank's network, and the propagation and vibration of dislocations are taken as examples derived from a few fundamental equations which have a correspondence to Maxwell's equations. (Author)

AD-255 512 Div. 25
(11 May 61) OTS price $1.10

Yale U., New Haven, Conn.
EXPLORING THE FORM OF A YIELD SURFACE BY MEANS OF ROTATION TESTS,
by Aris Phillips. Dec 60, 6p. illus. (Technical rept. no. 10)
(Contract Nonr-60912, Proj. NR-064-415)
Unclassified report

DESCRIPTORS: *Plasticity, Deformation, Rotation, Tests, *Plastic flow, Stresses, Theory, Mathematical analysis.

AD-255 522 Div. 25, 2, 12, 20
(8 May 61) OTS price $0.50

National Aeronautics and Space Administration, Washington, D. C.
SATELLITE MAGNETIC FIELD MAPPING,
by James P. Heppner, Joseph C. Cain, and others. May 61, 20p. incl. illus. tables (Technical note D-696)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-696.

DESCRIPTORS: Satellite vehicle research, *Magnetic fields, Mappings, *Magnetometers, Protons, Instrumentation, *Magnetic storms, Terrestrial magnetism.

a preliminary analysis is made of data from the Vanguard III satellite (1959 ETA). The resulting scalar field measurements are plotted against computed values obtained from three different analyses: Finch and Leaton coefficients, Jensen and Whitaker coefficients from U.S.N.H.O. charts, and Jensen and Whitaker coefficients from Russian charts. The topics discussed include: The accuracy of spherical harmonic analyses of the earth's field, possible magnetic field discontinuities associated with the inner radiation belt, and magnetic storm effects. (Author)

AD-255 542 Div. 25
(8 May 61) OTS price $4.60

Polytechnic Inst. of Brooklyn, N. Y.
COMPOUNDS WITH DEFECT LATTICE.
Final rept. 15 Nov 57-31 Jan 61, 31 Jan 61, 36p. incl. illus. tables.
(Contract DA 36-039-sc-74958, Proj. 3-99-15-110)
Unclassified report

DESCRIPTORS: *Tungsten compounds, Oxides, *Tantalum compounds, *Ferroelectric crystals, *Ferroelectric materials, *Selenides, Copper compounds, *Barium compounds, *Aluminum compounds, Lanthanum compounds, Crystal structure, Lattices, Phase studies, Phase transitions, Transition temperature, Electromagnetic properties, Magnetic properties, *Metallic crystals, *Ferrites, X-ray diffraction analysis.

The solid-state reaction between WO3 and Ta2O5 was studied at 1000 and 1200 C, in vacuo, and under O pressures up to 2.8 atm. At 1200 C, 4 phases were found. The existence of an extensive homogeneity range in the system Cu(x)Fe(1-x)Se is shown by X-ray diffraction data. The phase extends from CuFeSe2 to FeSe. Thermoelectric measurements show a transition from p-type to n-type (at room temperature) at a composition between Cu(1.29)Fe(1.71)Se3 and Cu(1.42)Fe(1.58)Se3. On the basis of the observed structure, calculations of the Brillouin zones indicated that the zone would be filled at about Cu(1.08)Fe(1.92)Se3. An investigation has been started of charge compensated substitution of divalent ions in the magnetoplumbite structure. Preparations of the type BaAl(12-x)M(x)O(19-x)F(x) and Ba(1-x)La(x)M(x)Al(12-x)O19 were made, where M is Ni(++), Co(++), Mn(++), Zn(++), Cu(++), Fe(++) and some mixtures, notably Zn, Ni and Zn,Co.

AD-255 559 Div. 25, 1
(8 May 61) OTS price $5.60

Aerospace Ground Equipment Engineering Div., Wright-Patterson Air Force Base, Ohio.
SUPPRESSION OF NOISE IN GROUND SUPPORT EQUIPMENT.

by Harold D. Swann. Rept. for Aug 60-Jan 61 on System no. 102-A. Mar 61, 44p. incl. illus. tables.
(In cooperation with the Flight and Engineering Test Group)
(WADD TN 61-6) Unclassified report

DESCRIPTORS: *Jet plane noise, Ground-support equipment, Noise, Acoustics, Countermeasures, Air conditioning equipment, Reduction, Airplane engine noise, Attenuation, Hydraulic systems, Internal combustion engines, Electrical equipment, Jet planes, Jet engine noise.

The purpose of this investigation was to determine a relatively inexpensive, palliative method of reducing the acoustical noise levels of Ground Support Equipment (GSE). The major problem was found to be the engine exhaust noise emanating from standard Air Force Packette, air-cooled, internal combustion engines. Of lesser importance were such items as generators, air blowers, pumps, and gear trains. The findings of this effort indicate that the noise level of any Packette engine-driven unit of GSE can be significantly reduced, without causing deleterious effects on power output, by effective muffling and other palliative methods. (Author)

AD-255 582 Div. 25, 30
(7 May 61) OTS price $1.60

Ohio State U. Research Foundation, Columbus.
MEASUREMENT OF TEMPERATURE BELOW 1 DEGREE K,
by J. G. Daunt and D. O. Edwards. Apr 61, 15p. incl. illus. table, 24 refs. (Technical rept. no. 2)
(Contract N6onr-49520, Proj. NR018-412)
Unclassified report

DESCRIPTORS: Temperature, Measurement, *Thermometers, *Paramagnetic salts, Single crystals, Instrumentation, Nitrates, Paramagnetic resonance, Low temperature research, *Cryogenics, Cerium compounds, Magnesium compounds.

Contents:
Paramagnetic thermometry
Paramagnetic substances for thermometry
Measurement of the paramagnetic susceptibility

AD-255 583 Div. 25, 30
(5 May 61) OTS price $1.10

Technische Hochschule, Munich (Germany).
EXPERIMENTS AND INVESTIGATIONS ON HEAT TRANSFER BY LIQUIDS AT OR NEAR THEIR CRITICAL POINTS,
by Ernst Schmidt. Quarterly status rept. no. 9. 10 Apr 61, 3p. illus.
(Contract N62558-1906)
Unclassified report

DESCRIPTORS: *Liquids, *Heat transfer, Germany, Liquefied gases, Carbon dioxide, *Fluids, Thermodynamics, Temperature, Pressure, Measurement, Test equipment, Cooling, Gas turbine blades, Rocket motor nozzles.

Calculations indicated that better results might be obtained in heat transfer studies if the fluid is enclosed completely in a tube by a valve, and by determining the critical state or a deviation from it with the help of the temperature, which can be measured very exactly, and the mass of the fluid contained in the known volume of the tube. An apparatus built to measure these quantities consists of 2 tubes, one for the heat transfer measurements at critical state conditions, and the other for adjusting the contents of the first. The tubes are hung at 2 ends of the beam of a weighing machine and connected to each other by a thin, steel capillary. Both tubes have valves at their upper ends to seal their contents. The second tube is provided with a pressure gage at its upper and lower ends and is surrounded by a heating device.

AD-255 609 Div. 25, 2, 7
(12 May 61) OTS price $12.50

Office of the Assistant Chief of Staff for Intelligence, Dept. of the Army, Washington, D. C.
OPTIC IN INSTALLATIONS FOR THE UTILIZATION OF SOLAR ENERGY (Optika v Ustanovkakh dlya Ispol' Zovaniya Solnechnoy Energii)
by V. B. Veynberg. 1959, 1v. incl. illus. tables.
(Intelligence trans. no. H 4787)
Unclassified report

DESCRIPTORS: *Solar energy, *Optical systems, USSR, *Electric power production, Solar furnaces, Thermal radiation, Heat exchangers, Power, Reflectors, Lenses.

Only an exceedingly small fraction of solar radiation reaching the earth is transformed into fossil fuel, the energy of rivers, and wind. It will undoubtedly not be long before mankind will turn to the primary source of energy on earth - the sun. The inclusion of solar power into the power system of the country may procced in two directions: Planning and design of buildings and windows with which reduction may be made in consumption of fuel for heating and in electrical energy for illumination. Conversion of various industries to enable utilization of the energy obtained from solar units. In areas where there are many sunny days per year and hydroelectric power stations are available, the connection of solar power stations into the local power sources may be economically feasible. Requirements for reducing the cost of solar energy are summarized. (Author)

AD-255 669 Div. 25, 4
(12 May 61) OTS price $3.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
THE INVESTIGATION OF HIGHER ORDER TRANSFORMATIONS BY THERMAL ANALYSIS,
by Jean Jaffray, trans. by George R. Loehr. Mar 61, 26p. incl. illus. (Technical notes no. FRL TN 38)
Unclassified report

Trans. from Jnl. des Recherches du Centre National de la Recherche Scientifique, pp. 153-163, 1947.

DESCRIPTORS: *Thermodynamics, Temperature, *Transformations, Specific heat, Transition temperature, Cooling, Chromium compounds, Oxides, Copper compounds, Sulfates, Sodium compounds, Ammonium radicals, Beryllium compounds, Nitrates, Nitrites, Acetates.

In higher order transformations, latent heat is not involved; instead, specific heat increases with accelerating rapidity up to the transition temperature and then drops suddenly. Techniques of differential thermal analysis are described. Results are given for analyses of sodium nitrite, basic beryllium acetate, chromic oxide, dichromates, ammonium nitrate, and copper sulfate pentahydrate. (Author)

AD-255 670 Div. 25
(10 May 61) OTS price $1.10

Friedman, Morris D., West Newton, Mass.
MAXWELL EQUATIONS IN A ROTATING REFERENCE SYSTEM,
by IU. N. Barabanenkov. Jan 61, 6p. (Trans. no. B-173 from NDVSh, Fiz-Mate. Nauki, 1:141-145, 1959)
(Contract AF 19(604)5969)
(AFCRL-33) Unclassified report

DESCRIPTORS: *Electromagnetic fields, USSR, Partial differential equations, Electromagnetic waves, *Electromagnetic theory, *Magnetic fields, Rotating structures, Spheres, *Electric fields, Rotation.

The Maxwell equations in a rotating reference system are reduced to a three-dimensional vector form. The equations obtained are used to compute the electromagnetic field of a rotating magnetized body in a reference system bound to the body. (Author)

AD-255 673 Div. 25
(10 May 61) OTS price $1.60

Friedman, Morris D., West Newton, Mass.
HETERODYNING OF LIGHT,
by S. I. Borovitskii and G. S. Gorelik. Feb 61, 11p. incl. illus. (Trans. no. B-176 from Usp. Fiz. Nauk 59:543-552, 1956)
(Contract AF 19(604)5969)
(AFCRL-56) Unclassified report

DESCRIPTORS: *Light, *Interference, Optics, Photoelectric cells, *Frequency converters, Analysis, Detection, Signal-to-noise ratio, Design, Radiofrequency, USSR, Theory.

An analysis is given of heterodyning of light, the mixing of 2 optical spectral lines whose difference frequency is in the microwave band of radio frequencies by using a photoelectric converter. A review is included of the paper by A. T. Forrester, R. A. Gudmundsen, and P. O. Johnson (Phys. Rev. 99:1691, 1955), which describes experiments in which the production of the interference of 2 incoherent light emissions was accomplished. The review offers an explanation of the experiments, and a description of the equipment used.

AD-255 674 Div. 25
(10 May 61) OTS price $1.10

Friedman, Morris D., West Newton, Mass.
SINGULAR SOLUTIONS OF THE SPINOR EQUATION AND ELECTRON THEORY,
by L. E. Lebedev. Feb 61, 9p. incl. illus. (Trans. no. L-137 from Izvestiia VUZ, FIZIKA 4:22-29, 1960)
(Contract AF 19(604)5969)
(AFCRL-57) Unclassified report

DESCRIPTORS: *Electrons, Quantum mechanics, Relativity theory, Spin, Wave analysis.

On the basis of a new representation of the nature of the PSI-function, the Dirac equation is generalized for a free electron. The source of a PSI-field is introduced. A solution of this equation is constructed and certain of its properties are investigated. A number of new results were obtained: the classical convergence of the intrinsic electron energy; the existence of specific energy of the quantum bond and the presence of an excited (virtual) electron level. Corollaries are formulated which result from the possibility of extending the conception proposed to proton theory. (Author)

AD-255 675 Div. 25
(10 May 61) OTS price $1.10

Friedman, Morris D., West Newton, Mass.
REST MASS OF LIGHT AND INTERFERENCE PHENOMENA,
by I. R. Plotkin. Feb 61, 6p. incl. illus. (Trans. no. P-160 from Izvestiia VUZ, FIZIKA 6:90-94, 1959)
(Contract AF 19(604)5969)
(AFCRL-58) Unclassified report

DESCRIPTORS: *Light, *Interference, Mass energy relation, Mathematical analysis, USSR.

The rest mass of one and a set of two light beams is calculated. It is shown that in the ideal interference experiment studied by Laue, the rest mass of light changes similarly to the additive energy. (Author)

AD-255 676 Div. 25, 15
(10 May 61) OTS price $1.60

Friedman, Morris D., West Newton, Mass.
CONFORMAL MAPPING IN THE GENERAL THEORY OF RELATIVITY AND CERTAIN QUESTIONS OF COSMOLOGY,
by I. IA. Pugachev. Feb 61. 10p. (Trans. no. P-162 from Izvestiia VUZ, FIZIKA 1:46-53, 1960)
(Contract AF 19(604)5969)
(AFCRL-59) Unclassified report

DESCRIPTORS: *Conformal mapping, *Relativity theory, USSR.

Known solutions of the gravitation equations using conformal mapping contain assumptions which not only limit their generality but can also be the subject of discussion. An exact solution is obtained herein of a similar problem with a minimum of additional hypotheses. The physical consequences which here result differ substantially from the usual conception of an expanding universe. (Author)

AD-255 677 Div. 25
(10 May 61) OTS price $1.10

Friedman, Morris D., West Newton, Mass.
INFLUENCE OF ULTRASOUND ON CERTAIN PHYSICAL PROPERTIES OF FERROELECTRIC SALT CRYSTALS,
by T. KH. Chormonov. Feb 61, 4p. incl. illus. (Trans. no. C-125 from Izv. AN USSR, Ser. Fiz., 24:1347-1349, 1960)
(Contract AF 19(604)5969)
(AFCRL-93) Unclassified report

DESCRIPTORS: *Ferroelectric crystals, *Ferroelectric materials, *Crystals, *Ultrasonics, Physical properties, *Salts, Growth, Crystallization, Mechanical properties, Crystal structure, Hardness, Dielectric properties, Interference, Diffusion, X-ray diffraction analysis, Intensity, Attenuation, Sound, USSR.

CONTENTS:
Growing Ferroelectric Salt Crystals Under the Effect of Ultrasound
Investigation of the Microhardness of Sound-Bombarded Crystals of Ferroelectric Salts
Influence of Ultrasound on the Dielectric Permeability and Dielectric Losses of Ferroelectric Salt Crystals
On the Influence of Ultrasound on the Diffusion Width and on the Intensity of the Interference Lines of Ferroelectric Salts

AD-255 687 Div. 25
(12 May 61) OTS price $3.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
THE EFFECT OF COULOMB SCATTERING ON TWO-STREAM INSTABILITIES IN A PLASMA,
by D. A. Tidman. Apr 61, 34p. (Technical note no. BN-242)
(Contract AF 49(638)401)
(AFOSR-665) Unclassified report

DESCRIPTORS: *Plasma physics, *Scattering, Electrons, Ions, Mathematical analysis, Stability, Perturbation theory, Integration, Integral transforms, Statistical functions.

The effect of a small amount of two-body scattering on the two-stream instability that occurs in a plasma of contrastreaming electrons and ions is investigated mathematically. This is done by assuming the electron-ion collision frequency is small and making a perturbation expansion in this quantity. The Fokker-Planck scattering formula for the coulomb interaction is used. As the ordered streaming energy of the electrons is thermalized, enhanced Landau damping competes with the growth of the instability. (Author)

AD-255 689 Div. 25, 17, 26
(10 May 61) OTS price $2.60

Magnetic Materials Lab., Lehigh U., Bethlehem, Pa.
MAGNETIC MATERIALS RESEARCH,
by G. P. Conard, II, and E. J. Jablonowski. Quarterly rept. no. 10, 16 Nov 60-15 Feb 61. 14 Mar 61, 19p. incl. tables.
(Contract DA 36-039-sc-78092)
Unclassified report

DESCRIPTORS: *Metal films, Thin films, Iron alloys, Films, Metallic smoke deposits, Deposits, *Magnetic alloys, Acetyl radicals, *Cobalt alloys, *Cobalt, Vapor plating, Magnetic properties, Decomposition, Magnetic materials, Temperature, Production, Pyrolysis, Acetones.

The report summarizes the work done on production of cobalt and cobalt-iron thin films by thermal decomposition of the acetylacetonates. Thin ferromagnetic films have been successfully prepared by the thermal decomposition process. A moderate degree of process control has provided films with a range of thickness and composition, and magnetic properties comparable to those of the bulk metal. The problems in utilizing the thermal decomposition method for thin film memory production are (1) improving the reproducibility and (2) reducing the coercivity of the film. (Author)

AD-255 691 Div. 25, 20, 30
(11 May 61) OTS price $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
SPIN ECHO RESONANCE,
by J. A. Cowen. Annual status rept. no. 3. 31 Mar 61, 23p. incl. illus. (Rept. no. LMSD-894819)
(Contract Nonr-254100; Proj. NR 048-125)
Unclassified report

DESCRIPTORS: *Paramagnetic resonance, Test equipment, Nuclear spins, Liquefied gases, *Cavity resonators, Data storage systems, Ammonia, Calcite, Potassium, Manganese, Calcium compounds, Carbonates, Lanthanum, Radiofrequency spectrum analyzers, Nitrates, Magnesium.

The theoretical and experimental parameters which determine electron spin-echo formation and lifetimes are discussed, particularly with reference to the present state of information storage in these systems. A new mechanism of physical interest, intraline spectral diffusion, is considered and some experimental results of its effect on spin-echo lifetimes reported. (Author)

AD-255 693 Div. 25
(11 May 61) OTS price $2.60

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
INTERACTIONS BETWEEN FAMILIES OF GLIDE DISLOCATIONS IN THE F. C. C. STRUCTURE,
by B. H. Kear. Interim rept. May 61, 15p. incl. illus. table, 15 refs. (Rept. no. I-A2182-2)
(Contract Nonr-260800)
Unclassified report

DESCRIPTORS: *Crystals, Deformation, Shear stresses, Plasticity, Plastic flow, Crystal structure, Stresses, Hardening, Lattices.

All the possible ways of forming simple boundaries by plastic deformation in any symmetry orientation are deduced. The orientation dependence of work hardening is briefly discussed in terms of the likelihood of forming boundaries consisting of Lomer-Cottrell sessile dislocations. Moreover, it is shown that breakup of boundaries under stress is more likely to yield interstitial jogs than vacancy jogs. (Author)

AD-255 694 Div. 25
(10 May 61) OTS price $15.00

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
FIRST JOINT PROGRESS REPORT OF THE LABORATORIES FOR MOLECULAR SCIENCE AND MOLECULAR ENGINEERING, MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASSACHUSETTS.
Jan 61, 204p. incl. illus. tables.
(Contracts Nonr-184110, Nonr-184150, AF 19(604)5482, AF 19(604)6155 and AF 33(616)5920)
Unclassified report

DESCRIPTORS: *Ferroelectricity, *Dielectrics, Resonance, Paramagnetic resonance, Single crystals, *Thermoelectricity, Thin films, Topology, *Materials, *Lattices, Garnet, Computers.

This rept. includes:
Energy Conversion Lab., Mass Inst. of Tech., Cambridge.
THEORETICAL AND EXPERIMENTAL RESEARCH ON THERMOELECTRICITY. 15 Jan 60, 1v. incl. illus. tables (Scientific rept. no. 4)
(Contracts AF 19(604)4153 and Nonr-184151)
(AFCRL-122)

THERMOELECTRIC PROCESSES AND MATERIALS. 1961 23p. incl. illus.

Computer Components and Systems Group, Mass. Inst. of Tech., Cambridge.
(No title) Series of progress repts. 1961. 1v. incl. illus. tables.
(Contract NObsr-77603)

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
THIN FILM DEVICES. 1961. 12p. incl. illus.
(Contract AF 33(616)5489 and AF 33(616)5477)

Division 25-PHYSICS

AD-255 697 Div. 25
(12 May 61) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
TECHNIQUES FOR MEASURING THE ANGULAR DISPERSION OF THE EASY AXIS OF MAGNETIC FILMS,
by Thomas S. Crowther. 24 Feb 59, rev. 30 Mar 60. 10p. incl. illus. (Group rept. no. 51-2)
(Contract AF 19(604)5200)
Unclassified report

DESCRIPTORS: Films, *Ferromagnetic materials, *Ferromagnetism, Measurement, Thin films.

Two methods for using a B-H looper in the measurement of the angular dispersion of the easy axis are presented. Results of the two methods agree within a factor of two. For a typical evaporated film 50% of the material is oriented within ± 0.5 degrees of the mean of the distribution and 98% within ± 2.0 degrees of the mean. (Author)

AD-255 705 Div. 25
(10 May 61) OTS price $4.60

Massachusetts Inst. of Tech., Cambridge.
SOLID-STATE AND MOLECULAR THEORY GROUP.
Quarterly progress rept. no. 40,
15 Apr 61. 31p. incl. illus. tables, 47 refs.
(Contract Nonr-184134)
Unclassified report

DESCRIPTORS: Solids, *Solid state physics, Atomic energy levels, Atomic spectrum, *Molecular spectroscopy, Atomic orbitals, Nuclear spins, Nuclear magnetic resonance, Hyperfine structure, Magnetic fields, *Molecules, Ferromagnetic materials, Nickel, Iron, Sodium compounds, Chlorides, Water, Fluorides, Rare earth elements, Nitrogen, *Nuclear physics, Energy, Polarization, Transition elements.

Contents:
Energy bands in Ni, by J. G. Hanus
Energy bands in Fe, by J. H. Wood
Augmented plane wave calculations for NaCl structure, by A. C. Switendick
Energy band calculations, by F. W. Quelle
A configuration interaction study of the electronic states of the water molecule, by D. P. Merrifield
Evaluation of multicenter integrals, by D. E. Ellis
Magnetic hyperfine interaction in N, by A. J. Freeman and R. E. Watson
Exchange polarization and the magnetic interactions of rare earth ions, by R. E. Watson and A. J. Freeman
The origin of the F-19 hyperfine structure in transition element fluorides, by A. J. Freeman and R. E. Watson

AD-255 706 Div. 25
(11 May 61) OTS price $2.60

Massachusetts U., Amherst.
GROWTH OF CRYSTALS IN ORIENTED AMORPHOUS POLYETHYLENE,
by Jane T. Judge and Richard S. Stein.
15 Apr 61, 1v. incl. illus. 14 refs. (Technical rept. no. 30)
(Contract Nonr-335700, Proj. NR 356-378)
Unclassified report

DESCRIPTORS: *Ethylenes, *Polymers, Crystals, *Crystal structure, Lattices, X-ray diffraction analysis, Refractive index, Heat treatment, *Crystallization, Cooling, Heating, Molecular structure, Growth, Plastics.

The growth of crystals from the melt in oriented crosslinked polyethylene was studied by X-ray diffraction and birefringence as a function of orientation. It was found that for samples elongated more than about 200%, the crystals grow with their c-axes parallel to the stretching direction. At elongations less than 200%, there is a rather abrupt transition to a mode of growth in which the b-axis is perpendicular to the stretching direction with a tendency for the a-axis to be aligned parallel to this direction. (Author)

AD-255 707 Div. 25, 2
(9 May 61) OTS price $10.50

Massachusetts Inst. of Tech., Cambridge.
ONE-DIMENSIONAL COMPRESSION AND WAVE VELOCITY TESTS,
by Robert V. Whitman, James E. Roberts and Shieh-Wen Mao. Rept. no. 4 on the Response of Soils to Dynamic Loadings. Aug 60, 132p. incl. illus. tables.
(Contract DA 22-079-eng-224)
(DASA-1199) Unclassified report

DESCRIPTORS: *Soils, Dynamics, Swamps, Pressure, Propagation, Wave analysis, Tests, Sound transmission, Creep, *Clays, Shear stresses, *Mechanical properties, *Stresses.

One portion of the Soil Dynamics Research effort during the past year is described. Included are: (1) A general discussion of the stress-strain relationship for particulate masses; (2) Specifications for the preparation of fat, backswamp clay samples by static compaction; (3) Data concerning creep, using a load rise-time of 30 millisec; (4) Description of a preliminary attempt to measure pore pressures during compression creep; (5) Data concerning the sonic dilitational wave velocity in a core of soft clay; and (6) Description of a preliminary attempt to measure the sonic dilitational wave velocity in a soft clay sample during consolidation. (Author)

AD-255 720 Div. 25, 30
(12 May 61) OTS price $9.10.

Naval Ordnance Lab., White Oak, Md.
IBM 704 FORTRAN PROGRAM FOR EVALUATING SEMICONDUCTOR SURFACE TRANSPORT INTEGRALS,
by Ethel G. Thomas. Dec 60, 90p. incl. tables.
(NAVORD rept. no. 6754) Unclassified report

DESCRIPTORS: *Digital computers, *Surfaces, *Semiconductors, Coding, Integral equations, Mathematical analysis, Numerical analysis, *Transport properties, Surface properties.

In connection with a theoretical study of surface transport in semiconductors, numerical evaluation of the final mobility formula was required. The mobility formula has the form of an integral of a transcendental function of an integral. Evaluation was required for a finite number of values of two parameters, one being the lower limit of the outer integral, the other occurring in the integrand of the inner integral. After removal of a singularity in the inner integral, both integrals were evaluated by Gaussian quadratures. The evaluation was done on the IBM 704 computer using the FORTRAN program given in this report. (Author)

AD-255 722 Div. 25, 12, 22, 30
(11 May 61) OTS price $2.60

Naval Ordnance Lab., White Oak, Md.
A PRELIMINARY DIGITAL COMPUTER PROGRAM (FORTRAN) FOR THREE-DIMENSIONAL HEAT CONDUCTION,
by W. M. Burley, Jr. 30 Jan 61, 25p. incl. illus.
(NAVWEPS rept. no. 7310) Unclassified report

DESCRIPTORS: *Digital computers, *Heat transfer, *Guided missiles, Coding, Heat, Temperature, Materials, Sources, Rockets, *Surface temperatures, Difference equations, Naval ordnance, Bodies of revolution,

A FORTRAN coded program was developed to calculate temperature distributions due to transient or steady state conduction heat transfer in one, two, or three-dimensional systems. Calculations in the program are based on a finite difference solution of the conduction equation in cylindrical coordinates. The system may be made of a group of different materials and may have distributed sources of heat. Applicability of a given problem to the program depends primarily on the boundary conditions available in the program. The program is written to provide for a choice of surface temperature or surface conductance for the boundary condition on the cylindrical surface when the conductance subroutine is included. (Author)

AD-255 731 Div. 25
(15 May 61) OTS price $1.10.

Washington Square Coll., New York U., N. Y.
PARAMAGNETIC RESONANCE IN THE SOLID STATE,
by Hartmut Kallmann and Neil Wotherspoon. Quarterly progress rept. no. 11, 1 Jan-31 Mar 61. Apr 61, 4p.
(Contract DA 36-039-sc-78056, Proj. 3-99-06-108)
Unclassified report

DESCRIPTORS: *Phosphors, Zinc compounds, Sulfides, Copper, *Paramagnetic resonance, Electron transitions, *Carbon tetrachloride, *Benzenes, X-ray generators, Monitors, X-ray absorption analysis, Radiochemistry, Phosphorescent materials, Radiation damage, Ions, Luminescent materials, Solids, Energy, Absorption,

The equipment for monitoring the output of the X-ray apparatus permits recording the dose rate during the irradiation of samples. It is now possible to compensate for changes of dose rate, or to integrate the chart to obtain the total dose. The scavenger efficiency of DPPH in C_6H_6 and in CCl_4 has been found to be essentially constant between 5 x 10 to the -4th power and 5 x 10 to the -3rd power moles/liter. The ratio of the rate of radical formation in CCl_4 to the rate in benzene is 240 to 1 for the same incident X-ray intensity. For equal absorption of energy, this ratio is about 50 to 1. At low temperature and low microwave power, the EPR spectrum of excited ZnS Cu activated phosphor consists of 7 well resolved lines. The strong central line is caused by trapped electrons and the four equally spaced lines are the result of the Cu (II) ions. (Author)

AD-255 735 Div. 25, 30
(9 May 61) OTS price $1.60

Plasmadyne Corp., Santa Ana, Calif.
A TECHNIQUE FOR MAKING LOCAL MEASUREMENTS OF THE CONDUCTIVITY AND VELOCITY OF A PLASMAJET,
by Meredith C. Gourdine. 22 June 60, 14p. incl. illus. (Rept. no. PLR-71)
(Contract AF 49(638)335)
(AFOSR-365) Unclassified report

DESCRIPTORS: *Plasma jets, *Electrical conductance, *Velocity, Measurement, Fluid flow, Test methods, Theory, *Plasma physics, Coils, Instrumentation, Magnet coils, Gas flow.

A technique is described for measuring the electrical conductivity and local velocity of a flowing plasma. The equipment consists of 3 coils (A, B, & C) placed close enough so that the magnetic lines of the exciter coil (A) link the 2 sensors, B and C, on either side of it. The electrical conductivity and the velocity of the streaming plasma is determined by comparing the amplitude and phase of the voltages sensed by B and C. The equations for the signals sensed by B and C are derived from Maxwell's equations determining the electro-magnetic fields and Ohm's Law for a moving conductor determining the current density. The signals from B and C can be amplified and displayed on the X and Y axes, respectively, of an oscilloscope.

AD-255 736 Div. 25
(9 May 61) OTS price $1.60

Plasmadyne Corp., Santa Ana, Calif.
MAGNETOHYDRODYNAMIC CHANNEL FLOW OF A ROTATING FLUID,
by Meredith C. Gourdine. 22 Dec 60, 14p. incl. illus. (Rept. no. PLR-86)
(Contract AF 49(638)335)
(AFOSR-138) Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, Plasma physics, Magnetic fields, Electric fields, Partial differential equations, Rotation, Green's function.

Research concerns an incompressible, viscous, electrically conducting fluid in steady flow in a long cylindrical channel to which an external torque is applied, making the fluid rotate. This rotation diffuses upstream and downstream due to viscosity; it is also carried downstream by convection. If, in addition, there is a uniform applied magnetic field in the channel, motion of the conducting fluid across the magnetic lines is retarded. The problem considered herein to determine how the rotational velocity was distributed in the channel, and how the applied magnetic field was distorted by this motion. (Author)

AD-255 737 Div. 25
(9 May 61) OTS price $1.60

Plasmadyne Corp., Santa Ana, Calif.
MAGNETOHYDRODYNAMIC SHEAR HEATING,
by Meredith C. Gourdine. 2 Feb 61, 16p. incl. illus. 4 refs. (Rept. no. PLR-93)
(Contract AF 49(638)335)
(AFOSR-497) Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Plasma physics, Heating, Heat transfer, Tests, Mathematical analysis, *Mercury, High temperature research, Theory, Conductivity, *Magnetic fields.

Many methods of heating a plasma to high temperatures have been investigated. Some of these are Joule heating, shock heating, and cyclotron resonance heating. Another method which may have considerable merit is magnetohydrodynamic (MHD) shear heating. In this method adjacent layers of plasma are made to rotate in opposite directions with the aid of Lorentz (JxB) forces. Viscous dissipation in this high shear region heats the plasma. The attractiveness of this

technique lies in the fact that viscosity increases with temperature, and unlike Joule heating MHD shear heating becomes more effective at high temperatures. The preliminary results of a theoretical and experimental investigation of MHD shear heating in mercury are presented. Mercury is a convenient working fluid because its properties are well known, and it is relatively simple to use in these experiments. A preliminary theory based on a crude model is presented which checks with experiments. (Author)

AD-255 738 Div. 25
(9 May 61) OTS price $4.60

Plasmadyne Corp., Santa Ana, Calif.
STUDY OF HEATING AND ACCELERATION OF PLASMA BY MAGNETIC FIELDS,
by Meredith C. Gourdine. Final project rept., Feb 58-Feb 61. 1 Mar 61, 14p. incl. illus.
(Rept. no. FR021-335)
(Contract AF 49(638)335)
(AFOSR-358) Unclassified report

DESCRIPTORS: *Plasma physics, Magnetic fields, Heating, Acceleration, *Plasma jets, Magnetohydrodynamics.

The purpose of this research was to investigate means of heating, accelerating, and channeling plasma jets by means of magnetic fields. The following investigations were performed: (1) Transient Electrodeless Discharge Experiments; (2) Steady-state Plasma Channelling Experiments; (3) The Punch Method of Compressing, Heating, and Confining a Plasma; (4) Relaxation Heating of a Plasma by Surface Interaction with a Magnetic Field; (5) Experiments on the Punch Method of Heating; (6) Propulsion Experiments with the Asymmetric Punch; (7) Magnetohydrodynamic Shear Heating; (8) The Two-Coil Induction Method of Measuring Conductivity; and (9) MHD Channel Flow of a Rotating Fluid. (Author)

AD-255 779 Div. 25, 15
(11 May 61) OTS price $1.60

California U., Berkeley.
THE MOTION OF CHARGED PARTICLES IN A RANDOM MAGNETIC FIELD,
by J. A. Crawford. 27 July 60, 18p. 11 refs.
(Contract AF 49(638)508)
(AFOSR-205) Unclassified report

Fourth Symposium on Mathematical Statistics and Probability, June 20-July 30, 1960.

DESCRIPTORS: Van Allen radiation belt, *Astrophysics, *Cosmic rays, Electrons, Protons, *Motion, Plasma physics, Velocity, Magnetic fields, Linear systems, *Equations, Functions, Particles, Linear accelerators, Differential equations, Theory, Probability.

AD-255 795 Div. 25, 8, 14
(10 May 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
HIGH-VOLTAGE PHOTOSENSITIVE THIN FILMS.
19 Apr 61, 2p. (Trans. from On the Problem of High-Voltage Photoelectromotive Forces in Thin Semiconductor Layers; Akademiya Nauk SSSR. Doklady 135:833-836, 1 Dec 60)
(AID rept. 61-53) Unclassified report

DESCRIPTORS: *Thin films, Photosensitivity, Resistance, Electrical properties, Voltages, *Photoelectric materials, Cadmium compounds, Tellurides, Antimony compounds, Bismuth compounds, Sulfides, Television cameras, Phototubes, Photoelectric cells, *Metal films, Semiconductors, Intermetallic compounds.

Photosensitive CdTe films with photoelectromotive forces as high as 150 to 180 v/cm were obtained for some CdTe specimens by alloying components and/or by introducing an arsenic impurity. The dependence of the magnitude of the output voltage in films on such process factors as film thicknesses and base temperatures was established. Optimum results were obtained in film thicknesses of the order of 1.5 microns. In addition to CdTe films, studies were made of binary and ternary chalcogenides of Sb and Be. With these materials it was also possible to obtain high-voltage output considerably exceeding the width of the forbidden zone. On the basis of the material resistivities studied it was indicated that high-voltage output depends on high resistivity.

AD-255 839 Div. 25, 8
(15 May 61) OTS price $4.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
MONOSTATIC AND BISTATIC MEASUREMENT OF SCATTERING SHAPES AND SYNTHESIS OF SCATTERING SHAPES,
by Edward M. Kennaugh. Final engineering rept. 1 Jan-31 Dec 60. 1 Jan 61, 45p. incl. illus. tables, 15 refs. (Rept. no. 1073-4)
(Contract AF 19(604)6157)
(AFCRL-193) Unclassified report

DESCRIPTORS: *Electromagnetic waves, Theory, Scattering, Matrix algebra, *Wave transmission, Reflection, *Asymmetric bodies, Angle of arrival, Couplings, Measurement, *Spheres, Mathematical analysis, Synthesis, Impedance.

Research was concerned with: (1) the development of scatter-signal measuring equipment capable of recording bistatic phase and amplitude information as a function of target aspect, and (2) the study, theoretically and experimentally, of methods of synthesizing targets to exhibit prescribed scattering properties. It was shown by representative examples that the far-field scattered waveform for short-pulse excitation of scatterers is relatively simple in form and can be related to geometrical and constitutive parameters of the scatterer. It also appears that a reasonable approximation to the response to impulsive plane-wave excitation can be obtained by superposition of scattering values at a number of equally spaced harmonic frequencies. If existing solutions or experimental data for additional scatterers are presented in this form, it should be possible to develop simple rules for predicting the waveform quite generally. (Author)

AD-255 841 Div. 25, 9, 30
(15 May 61) OTS price $11.00

Air Force Cambridge Research Labs., Bedford, Mass.
STATUS REPORT. ELECTRONIC MATERIAL SCIENCES LABORATORY,
3 Jan 61, 1v. incl. illus. (AFCRL-10)
Unclassified report

DESCRIPTORS: *Solid state physics, *Electronics, *Scientific research, *Radiochemistry, *Plasma physics, Crystals, *Bibliography, Preparation, Materials, Chemical analysis, Electronic equipment, High temperature research, Semiconductors, High pressure research, Thermoelectricity.

AD-255 869 Div. 25
(27 Apr 61) OTS price $4.60

Institute of Air Flight Structures, Columbia U., New York.
LONGITUDINAL IMPACT OF A SEMI-INFINITE ELASTIC CYLINDRICAL SHELL,
by Harvey Martin Berkowitz. Jan 61, 39p. incl. illus. table, 10 refs. (Technical rept. no. 27; CU-1-61-ONR-266(08)-CE)
(Contract Nonr-26608, Proj. NR 064-428)
Unclassified report

DESCRIPTORS: *Structural shells, *Terminal ballistics, *Cylindrical bodies, Stresses, Impact shock, Mathematical analysis, Deformation, Transformations (Mathematics), Shock waves, Elasticity, Integral transforms, Bessel functions, Differential equations.

The axially symmetric pressure signal produced by the longitudinal impact of a semi-infinite elastic cylindrical shell upon a rigid obstacle is determined by using membrane theory. In the equivalent problem for a solid cylindrical rod, a Laplace transform was used, and the major term of the solution was determined by an asymptotic approach. Proceeding along a similar plan in the case of the shell, it was possible to obtain not only the leading term of an asymptotic expansion for large values of the time, but also further terms. Consequences of the use of the membrane theory are discussed. (Author)

AD-255 870 Div. 25
(27 Apr 61) OTS price $3.60

Institute of Air Flight Structures, Columbia U., New York.
IMPACT OF AN ELASTIC TRUNCATED CONICAL SHELL,
by H. M. Berkowitz and H. H. Bleich. Jan 61, 27p. incl. illus. (Technical rept. no. 28; CU-2-61-ONR 26608-CE)
(Contract Nonr-26608, Proj. NR 064-428)
Unclassified report

DESCRIPTORS: *Terminal ballistics, Stresses, *Structural shells, *Conical bodies, Impact shock, Mathematical analysis, Differential equations, Transformations (Mathematics), Deformation, Bessel functions, Elasticity, Shock waves, Integral transforms.

The problem considered is the effect of the impact of an elastic, semi-infinite, truncated conical shell, moving with axial velocity V sub o toward a rigid obstacle. The interaction of shell and obstacle will produce an axially symmetric pressure signal which is to be determined. Based on the experience in the case of the cylindrical shell (AD-255 869), the present paper will use again a Laplace transform approach and restrict itself to the determination of the contributions to the inversion integral due to small and large values, respectively, of the transform parameter. (Author)

AD-255 892 Div. 25, 17
(16 May 61) OTS price $8.60

Manufacturing Labs., Inc., Cambridge, Mass.
PHASE EQUILIBRIA AND TRANSFORMATIONS IN METALS UNDER PRESSURE,
by Larry Kaufman. 1 Apr 61, 97p. incl. illus. tables. 101 refs.
(Contracts Nonr-260000 and AF 33(616)6837)
Unclassified report

DESCRIPTORS: *High pressure research, *Metals, *Phase transitions, Phase studies, Thermodynamics, Pressure, Temperature, Melting, Crystal structure.

Consideration of high pressure effects on phase equilibria and transformations from a thermodynamic point of view leads to the following conclusions: (1) in most cases quantitative thermodynamic predictions at a level of accuracy and reliability comparable to current high pressure observations cannot be carried out; (2) in cases where the nature of the high pressure phase can be directly determined or inferred with some assurance, qualitative predictions of high pressure effects can be made by the proper utilization of one atmosphere thermodynamic data; and (3) the present considerations indicate that a reiterative combination of one atmosphere thermodynamic data with high pressure observations could lead to a greater understanding of phase transformations and equilibria in metals at one atmosphere and high pressure. (Author)

AD-255 951 Div. 25
(16 May 61) OTS price $3.60

Washington Square Coll., New York U., N. Y.
RESEARCH ON SOLID STATE RADIATION-INDUCED PHENOMENA,
by Hartmut Kallmann. Quarterly rept. no. 4, Nov 60-31 Jan 61, Mar 61, 33p. incl. illus. tables.
(Contract DA 36-039-sc-85126)
Unclassified report

DESCRIPTORS: *Organic solvents, *Electrons, *Gamma rays, Fluorescence, Excitation, Photochemical reactions, Cadmium compounds, Sulfides, Solid state physics, Crystals, Photoconductivity, Electrical properties.

Using ac impedance measurements, the change in capacitance and the dissipation factor of insulated, photoconducting CdS crystals was investigated. With increasing intensity, the capacitance change reached a saturation value while the dissipation factor went through a maximum. Exactly the same curves were obtained at different bridge frequencies except that the lower frequencies shifted the curves to the lower intensities. These results are in agreement with the theory. (Author)

AD-255 963 Div. 25, 10
(15 May 61) OTS price $3.60

Naval Ordnance Test Station, China Lake, Calif.
HIGH TEMPERATURE HEAT CAPACITY EQUATIONS AND THERMODYNAMIC PROPERTIES OF COMBUSTION GASES,
by Mary M. Williams. 10 Feb 61, 34p. incl. tables, 14 refs. (NOTS TP 2606)
(NAVWEPS Rept. no. 7609) Unclassified report

DESCRIPTORS: *Thermodynamics, *Combustion, Heat of formation, Enthalpy, Entropy, Gases, Specific heat, *Hydrogen compounds, *Oxygen compounds, *Nitrogen compounds, *Carbides, *Metallic compounds, *Halides, *Halogens, *Silicon compounds, High temperature research, Theory, Mathematical analysis, Combustion chamber gases, *Metals, Flames.

The standard state heat of formation, reference enthalpy, reference entropy, and heat capacity equations for 200 chemical compounds are presented. These compounds are those experimentally shown to exist and those theorized as existing in high temperature combustion processes. Thermodynamic data are given for compounds consisting of the following chemical elements: hydrogen, oxygen, nitrogen, carbon, lithium, sodium potassium, rubidium, cesium, magnesium, aluminum, fluorine, chlorine, bromine, beryllium boron, silicon, and calcium. (Author)

AD-255 968 Div. 25, 12
(15 May 61) OTS price $3.60

Space Technology Labs., Inc., Los Angeles, Calif.
SATELLITE MATERIALS AND ENVIRONMENTAL CONTROL SYSTEMS INVESTIGATIONS,
by J. T. Bevans, Allan D. LeVantine, and E. E. Luedke. Final rept. 1 July-31 Dec 60, 31 Dec 60, 26p. incl. illus. (Rept. no. STL/TR-60-0000-19423)
(Contract AF 04(647)619, continuation of Contract AF 04(647)309)
(AFBMD TR 61-12) Unclassified report

DESCRIPTORS: *Satellite vehicles, Absorption, *Materials, Reflectometers, *Thermal radiation, Spectrographic analysis, *Reflection, Absorption, Solar energy, Solar spectrum, Infrared radiation, Simulation.

Spectral reflectances of approximately 30 different surfaces were measured. The computed solar absorptances are reported. The variation of the spectral reflectance and hence, the solar absorptance with the angle of incidence is presented for three specific types of materials. However, the major portion of the results were measured at an an angle of incidence of 15 degrees from the normal to the surface. The results of measurements of the uniformity of the energy distribution over the image plane of the solar simulator constructed in this laboratory are given, and a suggested modification is described. (Author)

AD-255 979 Div. 25, 14
(15 May 61) OTS price $4.60

Westinghouse Central Labs., Pittsburgh, Pa.
RESEARCH AND DEVELOPMENT OF HIGH TEMPERATURE FERROELECTRIC MATERIALS,
by E. C. Subbarao, T. Y. Tien and others. Quarterly progress rept. no. 4, 1 Feb-11 Apr 61. 11 Apr 61, 15p. incl. illus. table, 18 refs.
(Contract DA 36-034-501-ORD-3202, Proj. TA 1-2707)
Unclassified report

DESCRIPTORS: *Ferroelectric crystals, Phase transitions, Temperature, Piezoelectric crystals, Ceramic materials, Lattices, Crystal structure, Transition temperature, Dielectric properties, Niobates, Titanates, Fluorides, Calcium compounds, Oxides, *Titanium compounds, *Lead compounds, *Bismuth compounds, *Dielectrics, *Ferroelectric materials.

This report includes:
A FAMILY OF FERROELECTRIC BISMUTH COMPOUNDS, by E. C. Subbarao. 26 Apr 61, 1v. incl. illus. tables (Scientific paper no. 406FD533-P3)

The effects of small additions of various sintering aids (mineralizers) on the properties of PbTiO3 were evaluated. The majority of these additions produced strong PbTiO3 ceramics with densities greater than 90% of theoretical. CaF2 (in concentrations of 0.5 and 1.0 mol-%), improved the piezoelectric coefficient of PbTiO3 by a factor of 2 to 3. This large increase is believed to be related to the particular microstructure obtained for CaF2 bearing samples. Significant improvements in resistivity could lead to ferroelectric transducers for operation at temperatures beyond those of present commercially available materials. (Author)

26. PRODUCTION AND MANAGEMENT

AD-255 007 Div. 26, 1, 17
(8 May 61) OTS price $1.60

Lodge and Shipley Co., Cincinnati, Ohio.
MAGNESIUM ALLOY AIRFRAME,
by R. O. Sweeney and J. A. Warnken. Preliminary procedure rept. 28 Mar 61, 11p. incl. illus.
(Contract DA 33-008-ORD-2084, Proj. TN2-8106)
Unclassified report

DESCRIPTORS: *Manufacturing methods, *Airframes, Configuration, *Magnesium alloys.

AD-255 013 Div. 26, 17, 27
(1 May 61) OTS price $1.10.

Wright Aeronautical Div., Curtiss-Wright Corp., Wood-Ridge, N. J.
RADIAL EXTRUSION OF TURBOJET DISCS,
by Robert W. Krohn. Interim engineering rept. no. 10, 1 Jan-31 Mar 61, 31 Mar 61, 7p. (Serial rept. no. WP 00-228)
(Contract AF 33(600)37191)
Unclassified report

DESCRIPTORS: *Turbojet engines, Gas turbine disks, Manufacturing methods, *Extrusion, Production, Processing, Titanium alloys, Steel, Forging, Temperature, Mechanical properties, Microstructure, Tools, Dies, Forge presses, Instrumentation, Hardness, Heat treatment.

Work accomplished in the production of prototype compressor discs and the procedures which are expected to be followed in the remaining work of this phase are discussed. The procedures for preparing the discs for machining and the machining operations are presented. (Author)

AD-255 095 Div. 26, 12, 17
(28 Apr 61) OTS price $1.10

Lodge and Shipley Co., Cincinnati, Ohio.
MAGNESIUM ALLOY AIRFRAME.
by R. O. Sweeney and J. A. Warnken. Monthly progress rept. no. 1, 1-28 Feb 61. 10 Mar 61. 5p. incl. illus.
(Contract DA 33-008-ORD-2084, Proj. TN2-8106)
Unclassified report

DESCRIPTORS: *Airframes, *Magnesium alloys, Processing, Design, Production, Manufacturing methods, Configuration, Conical bodies, Metal plates.

Calculations based on the Floturn principle were completed of the configuration of the complete third operation for forming the HK31A Mg alloy component. A flat blank is used and 4 operations are considered necessary to form the completed part. The first 3 operations will combine Floturn and spinning techniques. The fourth operation will use only the Floturn technique. The calculations were extended to the configuration from station 8.5 to station 23 for the second and first operations.

AD-255 258 Div. 26, 1, 12, 17
(3 May 61) OTS price $1.10

Westinghouse Electric Corp., Blairsville, Pa.
HIGH ENERGY RATE EXTRUSION,

by G. A. Reimann. Interim technical progress rept. no. 2, on phase 2, 1 Jan-31 Mar 61. Apr 61, 8p. incl. illus.
(Contract AF 33(600)41948)
(ASC TR 7-882(II)) Unclassified report

DESCRIPTORS: *Machine tools, *Metals, Dies, Titanium alloys, Aluminum, Airframes, Tools, Processing, Hydraulic systems, *Extrusion, Explosive forming, Pneumatic systems, Design, Steel.

Two sets of tools for the Dynapak machine are being completed. The first extrusions will be made with a multiple-orifice die. The orifices are countersunk to included angles of 90, 120, 150, and 180 degrees. The effect of billet material, temperature, and lubricant, and the influence of fire pressure (or ram velocity) and the most favorable orifice configuration will be determined. From the experience gained with the multiple-orifice die, a single-orifice die will be designed. A 0.430-in. bore in this die will produce an extrusion ratio of 21.6 with a 2-in.-diam billet. Subsequent 4-bore and single-bore dies may be required to determine the optimum entry angle. About 140 billets 2- to 2.5-in. long of 2-in.-diam Al and 1020 steel and 1.875-in.-diam 304 stainless steel, 4340 steel, and Ti-6Al-4V alloy are programmed for extrusion through the multiple-orifice die. Strain gages will determine punch stresses, and a Sanborn linear velocity transducer will determine total ram velocity at impact and deceleration during extrusion.

AD-255 363 Div. 26, 17
(4 May 61) OTS price $4.60.

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SCIENTIFIC REPORTS OF HIGHER SCHOOLS. MACHINE CONSTRUCTION AND INSTRUMENT CONSTRUCTION (SELECTED ARTICLES).
7 Nov 60, 48p. incl. table. (Trans. no. MCL-142 from Nauchnyye Doklady Vysshey Shkoly, Mashinostroyeniye i Priborostroyeniye 2:7-14, 15-18, and 100-107, 1958)
Unclassified report

DESCRIPTORS: *Casting, Industrial production, USSR, Machining.

Contents:
Questions on scientific problems in the progress of foundry production, by D. P. Ivanov
The fundamental theoretical problems in the development of the technology of casting production, by N. N. Rubtsov
New types of castings and problems in raising the precision in casting, by N. N. Rubtsov.

AD-255 374 Div. 26, 17
(4 May 61) OTS price $8.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
POWDER METALLURGY,
by I. N. Frantsevich. 8 Nov 60, 94p. incl. illus. tables. (Trans. no. MCL-364 from Poroshkovaya Metallurgiya, Series 4:pp. 70, 1958)
Unclassified report

DESCRIPTORS: *Powder metallurgy, USSR, Metals, Cermets, Sintering, Extrusion, Porosity, Manufacturing methods, Processing, Refractory materials, Powder alloys.

A summary is presented of the historical development of the methods of powder metallurgy, and also a condensed description of the principle theoretical assumptions, properties, technology and the most important examples of the use of powder metal alloys in electrical engineering, metal works, machine construction, mining and jet technology related mainly to the use of gas turbines. The brochure was written in order to acquaint a wide circle of engineers, qualified workers, innovators and inventors of various branches of industry with the possibilities and methods of powder metallurgy. (Author)

AD-255 378 Div. 26, 17
(4 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PROBLEMS OF WELDING DISCUSSED AT THE PLENARY SESSION OF THE CENTRAL COMMITTEE OF THE COMMUNIST PARTY OF THE SOVIET UNION (Problemy Zvarania Na Plenarnom Zasadani UV KSSS).
27 Oct 60, 9p. (Trans. no. MCL-450 from Zvaranie 8:225-226, 1959)
Unclassified report

DESCRIPTORS: USSR, *Welding, Conferences, Electric welding, Automation, Metals, Alloys, Industrial production, Arc welding.

AD-255 407 Div. 26
(4 May 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ENGINEERING PRODUCTION (SELECTED ARTICLES).
14 Nov 60, 19p. incl. illus. (Trans no. MCL-573 from Strojirenska Vyroba 7:pp 304-305; 314-315, 1959)
Unclassified report

DESCRIPTORS: Manufacturing methods, USSR, *Machining, *Production, Costs, *Spark machining, *ELectroerosive machining, *Extrusion, Machine tools.

Contents:
Utilization of electroerosive treatment.
Saving on material and production costs by the use of rotary extrusion.

AD-255 443 Div. 26, 10, 17
(7 May 61) OTS price $6.60

Convair Astronautics, San Diego, Calif.
A THEORETICAL DESIGN STUDY APPLYING BERYLLIUM TO STORABLE LIQUID PROPELLANT ROCKET TANKAGE,
by R. L. Jones and R. E. Carlson. Rept. for June-Nov 60. Mar 61, 1v. incl. illus. tables.
(Contract AF 04(611)6081)
(AFFTC TR 60-67) Unclassified report

DESCRIPTORS: *Liquid rocket propellants, *Storage tanks, Design, Theory, Stainless steel, *Beryllium, Titanium alloys, Aluminum alloys, Physical properties, Mechanical properties, Manufacturing methods, Corrosion, Materials, *Fuel storage tanks.

A metallurgical and structural design study was conducted to determine the feasibility of using Be for storable liquid propellant rocket tankage in the near future. Only those sizes, shapes and properties of Be that are presently obtainable or that are anticipated to be obtainable in the near future were considered in the design study. Ninety tanks were analyzed to study the relationship of volume, pressure, payload, and material on the weight of tankage.

Be used as a tank material was compared to 301 stainless steel, AM355 CRT stainless steel, A110AT Ti alloy, and 5086-H34 Al alloy. Beryllium's use in bulkheads capable of withstanding negative pressure was investigated, several types of construction and the effects of varying the negative pressure. The results of the weight comparisons on tankage, bulkheads and adapters are presented in tables and graphs. The study includes sketches of a typical beryllium tank design and a compressive intermediate bulkhead. (Author)

AD-255 521 Div. 26, 12
(10 May 61) OTS price $0.75

National Aeronautics and Space Administration, Washington, D. C.
TRANSMISSION DEVICE FOR REVERSIBILITY OF ROTATION WITH EXTREMELY FAST ACTION,
by J. Boehm, A. L. Herrmann, and J. F. Blanche. May 61, 28p. incl. illus. (Technical note D-603)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-603.

DESCRIPTORS: Rotation, Motion, Tests, *Transmissions, *Power drives,

A new device for transmission of motion or power between a driving shaft and a coplanar or straight line driven shaft is presented. By means of this mechanism, the driven shaft can be successively rotated clockwise and counterclockwise by a driving shaft rotating continuously in one direction. Reversibility of rotation of the driven shaft can be achieved at extremely high rates because of the very small displacement and low inertia of the accelerated and decelerated elements. A prototype was investigated by a series of tests to determine the characteristics and capacities of this transmission device. The test arrangement and the tests are described, and the test results are discussed. Possible applications of this device are outlined. (Author)

AD-255 562 Div. 26, 17
(8 May 61) OTS price $7.60

Western Gear Corp., Lynwood, Calif.
HIGH ENERGY RATE FORGING DEVELOPMENT,
by J. M. Palsulich and M. L. Headman. Interim technical progress rept., 3 Jan-3 Apr 611. 3 Apr 61, 50p. incl. illus. table (Rept. no. 614-136)
(Contract AF 33(600)42523)
(AMC TR 7-866(1)) Unclassified report

DESCRIPTORS: *Machine tools, Forge presses, Explosive forming, Metals, *Forging, Extrusion, Alloys, Refractory materials, Heat resistant alloys, Precision finishing, Surface properties, Dies, Lubricants, Design, Airframes.

Dynapak (high energy rate forging) equipment users have been surveyed and are unanimous in their conviction that high energy rate forging is the greatest advance in forging technology for many decades. High energy rate forging has the potential for; (1) improving quality of forged parts (2) lowering forging costs, and (3) forging configurations that could not otherwise be produced by conventional forging practices. The following high energy rate forging information has been established: In most cases draft is not required; improved surface finishes are possible; closer tolerance and dimensional controls can be attained; difficult forging materials such as titanium, precipitation hardening alloys and refractory materials can be forged; and grain size in forged parts can be reduced. (Author)

AD-255 658 Div. 26, 12, 22
(11 May 61) OTS price $6.60

Diamond Ordnance Fuze Labs., Washington, D. C.
LOWER COST PACKAGING FOR GUIDED MISSILE ELECTRONICS,
by Kenneth E. Woodward. 28 Mar 61, 67p. incl. illus. tables (DOFL rept. no. TR-921)
(Proj. no. 77200)
Unclassified report

DESCRIPTORS: *Guided missile fuzes, Shock resistance, Electronic equipment, Vibration, Electromagnetic fuzes, Electric fuzes, Tests, *Packaging, Design, Vibration isolators, Damping, Test equipment, Costs, Production, Guided missiles, Coolants.

A study was made of packaging techniques for guided missile electronics in which it was pointed out that the real cost of such electronic devices is not that cost required to manufacture the end product, but that cost which includes its share of the financial burden of development and production. It was shown that the over-all costs could be reduced by shortening development programs through the elimination of steps in the packaging process and by substantially reducing the effects of the environment so that less costly electronic components can be utilized. The method is dependent upon the use of (1) mounting materials with certain specific qualities to insure optimum performance of packages in several simultaneous environmental situations and, if necessary, (2) cooling fluids compatible with anticipated heat inputs and stated engineering boundaries. (Author)

AD-255 898 Div. 26, 1, 27
(15 May 61) OTS price $14.50

Armour Research Foundation, Chicago, Ill.
INVESTIGATION OF SERVICEABILITY CRITERIA FOR USED ANTI-FRICTION BEARINGS,
by Leon L. Smith. Final technical engineering rept., 6 Aug 56-31 Aug 60. 28 Nov 60, 209p. incl. illus. tables (ARF rept. no. D114)
(Contract AF 33(600)33605)
(AMC TR 61-7-550) Unclassified report

DESCRIPTORS: *Bearings, *Jet engines, *Ball bearings, Vibration, Torque, Life expectancy, Air force equipment, Military requirements, Statistical analysis, Friction, Countermeasures, Test methods, Non-destructive testing, Test equipment.

An economical and rapid non-destructive method of testing used bearings to determine if they could be returned to service was developed. Factors, influencing additional service of assembled bearings which could be determined non-destructively, were investigated and a vibrational testing machine to evaluate critical factors was developed. The testing equipment signals, by both light and sound, when critical values are exceeded. (Author)

27. PROPULSION SYSTEMS

AD-255 973 Div. 26, 17
(16 May 61) OTS price $1.10

Titanium Metals Corp. of America, Toronto, Ohio.
DEVELOPMENT OF FINE DIAMETER, HIGH STRENGTH Ti-13V-11Cr-3Al WIRE,
by E. Bohanek. Monthly progress rept. no. 13, 1-31 Mar 61. 3 May 61, 3p. incl. tables.
(Contract NOw-60-0188)
Unclassified report

DESCRIPTORS: *Drawing (Machine processing), *Wire, *Titanium wire, Manufacturing methods, Production, Heat treatment, Coatings, Titanium alloys, Vanadium alloys, Chromium alloys, Aluminum alloys, Mechanical properties, Tensile properties.

About 5 lb of wire were finish processed to 0.004 in. diameter. The remaining 7 lb were at 0.006 in. diameter, being re-strand Cowles-and-lime coated for drawing to 0.004 in. diameter. It appears that the maximum strength is achieved by a 48-hr aging at 700F. Pickling appears desirable to improve strength. In a 35 HNO3-5HF bath only about 0.0003 in. are removed from the diameter. Slow heat-up rates were not conducive to strength improvements in this highly cold worked fine wire product. Controlled cold work prior to aging is not conducive to strength increases. (Author)

AD-255 987 Div. 26, 7, 27, 31
(15 May 61) OTS price $6.60

Armour Research Foundation, Chicago, Ill.
DETERMINATION OF PRACTICAL LIMITATIONS OF UNBALANCE FORMULAE APPLICABLE TO LIGHTWEIGHT AND HIGH-SPEED MACHINERY.
Final rept. 15 Jan 57-14 Mar 59, on Proj. K114. Nov 60, 1v. incl. illus. tables.
(Contract NObs-72244)
Unclassified report

DESCRIPTORS: *Machines, Vibration, Theory, Measurement, Standards, Reduction, *Fans, Industrial production, Mathematical analysis, Military requirements, Naval equipment, *Gas turbine rotors, Bearings, *Rotary pumps, Blowers, *Steam turbine rotors, *Generators, *Electric motors.

MIL-STD-167 (Ships), dated 20 Dec. 1954, contains the primary naval requirements for the balancing of rotors. The balance formulae contained therein have practical and theoretical limitations, particularly insofar as high-speed machinery having flexible rotors is concerned. Efforts were made to investigate the subject military standard and to perform such analyses and experimental work as necessary to the establishment of more realistic balancing criteria. The investigation resulted in the development of basic formulae covering various aspects of rotor balancing. As a consequence of the application of these data, as well as the comparison of the direct requirements and the indirect implications of the military standard with industrial practices for precision and semi-precision machinery, and a comparison with information that is otherwise a part of the state of the art, several definite recommendations and suggestions were formulated. A summary of these conclusions and recommendations is given. (Author)

AD-255 039 Div. 27, 9, 25
(3 May 61) OTS price $2.60

Plasmadyne Corp., Santa Ana, Calif.
ARC PLASMA THRUSTOR STUDIES,
by R. J. Page, R. D. Buhler and others. 1 Dec 60. 1v. incl. illus. (Rept. no. PLR-90)
(Contracts DA 04-495-ORD-1806 and AF 33(616)7112)
Unclassified report

DESCRIPTORS: *Plasma physics, Electric arcs, Helium, Hydrogen, Thrust, *Spaceships, Lunar probes, *Rocket propulsion, Heat transfer, Cooling, Design, Tests, *Plasma jets, *Electric propulsion, Supersonic nozzles, Combustion chambers, Rocket motor nozzles.

Performance measurements of arc jet thrustors in a range of thrust levels are presented and analyzed. Performance comparisons between hot wall and cold wall designs are given. Attempts are made to isolate the relative heat transfer, dissociation, and other losses and to compare these with simplified calculations. (Author)

AD-255 061 Div. 27, 17, 26
(2 May 61) OTS price $9.60

Budd Co., Philadelphia, Pa.
DEVELOPMENT OF HIGH PERFORMANCE ROCKET MOTOR CASE,
by R. C. Dethloff. Engineering quarterly progress rept. no. 9, 1 Jan-31 Mar 61. 31 Mar 61. 119p. incl. illus. tables.
(Contract DA 36-034-ORD-3296)
Unclassified report

DESCRIPTORS: *Rocket motors, Rocket cases, Materials, Stainless steel, Titanium alloys, Steel, Nickel alloys, Manufacturing methods, Mechanical properties, Sheets, *Welded joints, Tensile properties, Heat treatment, Quality control, Test methods.

Continued progress is reported on the development of a high performance rocket motor case. A program was established for evaluating properties of sheet material made from ingots employing a controlled solidification technique. A series of fusion butt welded joints in 5 high strength steel alloys and 3 titanium alloys in various heat treat conditions was started using tungsten inert arc welding and electron beam welding processes. Development work was cancelled on uniform high strength heads made from materials which attain their properties through cold reduction. A summary is given of the initial data developed from evaluation testing of materials. A discussion is presented of the method of fabricating specimens and testing. A detail testing procedure is also included. (Author)

AD-255 252 Div. 27, 14, 17
(3 May 61) OTS price $4.60

Stanford Research Inst., Menlo Park, Calif.
TUNGSTEN AND ROCKET MOTORS,
by A. S. Neiman, O. Preston, and D. A. Brown. Final rept. 23 Mar 61, 44p. incl. illus. 24 refs.
(Contract NOrd-18619)
Unclassified report

DESCRIPTORS: High pressure research, Oxides, High temperature research, Thermochemistry, Refractory materials, Control surfaces, Heat transfer, Shock resistance, *Tungsten, Thermal stresses, Chemical reactions, *Aluminum compounds, Exhaust nozzles, Exhaust gases, Solid rocket propellants, *Rocket motor nozzles, *Rocket motors.

A study was made of the behavior of W under conditions encountered in the exhaust stream from solid-propellant rocket motors, with particular emphasis on the effect of alumina. No significant reaction was found between W and molten Al2O3 under these conditions. The following reactions, listed in decreasing order of importance, were observed between W and the gaseous exhaust constituents: (1) 3H2O + W yields WO3 + 3H2, (2) 3CO2 + W yields WO3 + 3CO, (3) 9HCl + Al2O3 + 3/2 W yields 2AlCl3 + 3/2 WO2Cl2 + 9/2 H2; and the transfer of W through liquid Al2O3. Other gaseous constituents, CO, HCl, H2, and N2, did not react with W. An increase of HCl in the exhaust gas decreased the amount of Al2O3 deposited on nozzle and jetevator surfaces. Study of the effect of nozzle liner thickness on resistance to thermal shock indicated that an intermediate thickness range exists in which failure by thermal shock is most likely to occur. (Author)

AD-255 328 Div. 27, 12, 26
(5 May 61) OTS price $1.10

Lyon, Inc., Detroit, Mich.
DEEP DRAWN PRE-PRODUCTION UNITS A2 1ST STAGE POLARIS ROCKET MOTOR CHAMBERS AND A2 1ST STAGE POLARIS AFT CLOSURES,
by Wayne A. Martin. General rept. no. 6, 31 Jan-28 Feb 61. 28 Feb 61, 7p.
(Contract NOw 60-0630)
Unclassified report

DESCRIPTORS: *Guided missiles, Forging, Underwater to surface, Surface to surface, *Rocket cases, *Rocket motors, Processing, Manufacturing methods, *Machine tools, Dies, Hydraulic presses, Rocket motor nozzles, *Booster rockets, *Guided missile boosters.

AD-255 371 Div. 27
(4 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ANALYSIS OF PERFORMANCE OF THE SIMPLEST RAMJET COMBUSTION CHAMBER UNDER FLIGHT CONDITIONS
(Analiz Raboty Prosteyshey Pryamotochioy Kamery Sgoraniya V Usloviyakh Poleta),
by A. V. Talantov. 18 Oct 60, 13p. (Trans. no. MCL-331 from Izvestiya Vysshikh Uchebnykh Zavedeniy Mvo SSSR, Seriya Aviatsionnaya Tekhnika 2:122-133, 1959)
Unclassified report

DESCRIPTORS: *Ramjet engines, Mathematical analysis, *Combustion chambers, *USSR, Design, Jet engines, *Aerodynamics, *Thermodynamics, *Heat transfer, Turbulent flow, *Gas flow, *Flame propagation.

A mathematical analysis of the effect of flight conditions on ramjet combustion chamber dimensions is presented. The analysis is based on the relationships between the pressure, temperature, mixture composition, turbulence, and principal combustion characteristics. The relationships were studied principally for the combustion of a homogeneous mixture in a turbulent flow, in which the evaporation of fuel droplets and the mixing of its vapor with the air are fully completed at the instant of combustion start.

AD-255 418 Div. 27, 17
(7 May 61) OTS price $2.60

Aerojet-General Corp., Azusa, Calif.
INVESTIGATION OF STRESS-CORROSION CRACKING OF HIGH-STRENGTH ALLOYS,
by R. B. Robinson and R. J. Uzdarwin. Quarterly progress rept. no. 3, 1 Jan-31 Mar 61. 24 Apr 61, 7p. illus. tables (Rept. no. 0414-01-3)
(Contract DA 04-495-ORD-3069)
Unclassified report

DESCRIPTORS: *Corrosion, *Stresses, Surface properties, Fracture (Mechanics), *Alloys, *Steel, *Stainless steel, *Titanium alloys, Rocket motors, *Rocket cases, Atmosphere, Corrosion inhibition, Welding, Corrosive gases, Microstructure, Corrosive liquids, Mechanical properties, Tensile properties, Deformation.

Environmental stress-corrosion studies were conducted on Vascojet 1000 alloy steel for 2 weeks. The only observed failures have been on the specimens heat-treated to approximately 240,000 psi, and in tap-water, distilled-water, and salt-water environments. No resolution of the discrepancies between the tensile stresses as calculated from tables and as measured by strain gages has yet been achieved. (Author)

AD-255 685 Div. 27, 12, 14
(10 May 61) OTS price $1.10

High Temperature Materials, Inc., Boston, Mass.
PYROLYTIC CARBIDE DEVELOPMENT PROGRAM.
Monthly progress rept. no. 11, 1-31 Mar 61. 31 Mar 61, 6p. incl. illus.
(Contract NOw 60-0292)
Unclassified report

DESCRIPTORS: Guided missiles, Surface-to-surface, *Refractory materials, *Carbides, *Rocket motor nozzles, Tantalum compounds, Hafnium compounds, Pyrolysis, Vapor plating, Niobium compounds, Refractory coatings, Chlorides, Thickness, Hardness.

The components required for the modification of a HTM production furnace, which will be used for coating POLARIS A-3 nozzles with carbides, were constructed and final preparations are being made for the start of operation. The investigation was continued for the development of sound crack-free tantalum carbide coating on ARC nozzles and success was achieved. Two additional hafnium carbide coated ARC test nozzles were produced in addition to plate specimens for property measurements. (Author)

AD-255 717 Div. 27, 30
(11 May 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
COMPARATIVE MEASUREMENTS OF BEAM POWER IN ION-ROCKET RESEARCH,
by E. A. Richley, V. A. Sandborn, and others. May 61, 32p. incl. illus. table, 14 refs.
(Technical note D-845)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-845.

DESCRIPTORS: *Electric propulsion, Power, *Ion rockets, *Ion beams, Measurement, *Calorimeters, Potentiometers, Design, Electric currents, Test methods, Test equipment, Temperature sensitive elements, Test facilities.

Preliminary results obtained from three schemes for measuring high-current ion-beam powers in experimental ion-rocket engines are reported. Electrical current and potential meter values were used to calculate ion-beam power; this metered power is compared with the intercepted ion-beam power as measured by two types of calorimeters. A segmented steady-state calorimeter with a 5- by 25-cm beam collector plate metered the power by the temperature difference measured across a calibrated thermal resistance. The other calorimeter system was a rake of nine hot-wire calorimeters that had as sensitive elements 0.001- by 0.50-cm wires. The fine, electrically heated wire responds to ion impingement with a voltage output proportional to the temperature (resistance) change of the wire. The three methods resulted in agreement of approximately + or - 5% for cesium ion-beam powers over the range of 400 to 1000 watts. (Author)

AD-255 788 Div. 27, 25
(10 May 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
MAGNETIC MIRROR ACCELERATION OF PLASMOIDS.
10 Apr 61, 2p. (Trans. from Calculation of Electrodynamic Ejection of an Undeformed Plasma Ring from the Magnetic Mirror. Zhurnal Teknicheskoy Fiziki 31:78-83, Jan 61)
(AID rept. 61-46) Unclassified report

DESCRIPTORS: Technological intelligence, USSR, *Electric propulsion, *Plasma physics, *Ion rockets, *Plasma jets, Acceleration, Magnetic effects, Numerical analysis.

Research is reported on the acceleration of plasmoids by inductive magnetic-mirror systems; this poses the problem of parasitic inductances and leakage of the field, where the coupling coefficient between the primary metal ring and the plasmoid is less than unity. In order to analyze these effects, a numerical integration was performed of the equation of motion for an ideally conducting thin plasmoid ring subject to a time-variable magnetic field of the mirror system. (Author)

AD-255 830 Div. 27, 12, 21
(12 May 61) OTS price $15.00

Air Force Office of Scientific Research, Washington, D. C.
PROCEEDINGS OF SECOND SYMPOSIUM ON ADVANCED PROPULSION CONCEPTS SPONSORED BY AIR FORCE OFFICE OF SCIENTIFIC RESEARCH (ARDC) AND AVCO-EVERETT RESEARCH LABORATORY, A DIVISION OF AVCO CORPORATION, 7-8 OCTOBER 1959, BOSTON, MASSACHUSETTS. (VOLUME I).
Oct 59, 209p. incl. illus. tables.
Unclassified report

DESCRIPTORS: *Propulsion, *Symposia, *Electric propulsion, *Plasma jets, *Nuclear propulsion, Cesium, Shock tubes, Rocket propulsion, Space flight, Ion rockets, Satellite vehicles, Rocket motors, Magnetohydrodynamics.

Contents:
Electrical propulsion concepts
The Arc jet
Magnetohydrodynamic acceleration of slightly ionized, viscously contained gases
A critical evaluation of the ion rocket
The colloid rocket: Progress toward a charged-liquid-colloid propulsion system
Pulsed plasma accelerator
Plasma pinch engine - The problem of repeated pinches
A comparison of the specific thrust of ion and plasma drive accelerators
Ion plasma research
Grid electrode ion rockets for low specific impulse missions
Problems of magnetic propulsion of plasma
High speed shock waves in a magnetic annular shock tube
Charged droplet experiment
Cesium ion motor research
Charged exchange neutralization of ion beams

AD-255 940 Div. 27, 25
(15 May 61) OTS price $10.10

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
STUDY OF THERMAL RADIATION WITHIN SOLIDS AND STUDY OF INTERNALLY ABLATING COMPOSITES,
by Franklin A. Vassallo, Gerald A. Sterbutzed, and Henry P. Kirchner. Quarterly progress rept. no. 5, 1 Oct-31 Dec 60. 31 Dec 60, 119p. incl. illus. tables. (Rept. no. HF-1395-M-5)
(Contract AF 33(616)6886)
(ARPA Order no. 24-60, Task 6)
Unclassified report

DESCRIPTORS: *Rocket motor nozzles, Steel, *Ablation, *Thermal radiation, Rocket motors, Refractory materials, Mathematical analysis, High temperature research, Heat transfer, Cooling, Combustion chamber gases, Solids, Solid rocket propellants, Plastics, Ethylenes, Fluorides, Polymers, Theory, Melting, Decomposition, Vaporization, Materials.

An evaluation was made of a design concept for a rocket nozzle material combination which utilizes high radiative transport as a means for cooling and maintaining dimensional stability of its heated surface. The analysis of the case of zero absorptivity within the materials leads to the conclusion that this concept can be highly effective. An analysis was also made of composite materials so designed that high heat flux at one face will cause one phase to act as an energy absorbing material by melting, vaporizing, or decomposing and thereby flowing out through the heated surface and in so doing cool the other phase and maintain its dimensional stability. This combined process is referred to as internal ablation. (Author)

AD-255 946 Div. 27, 12, 14
(15 May 61) OTS price $1.60

General Electric Co., Cincinnati, Ohio.
FABRICATION OF PYROLYTIC GRAPHITE ROCKET NOZZLE COMPONENTS,
by D. J. Shipp. Progress rept. for Mar 61. 7 Apr 61, 13p. incl. illus. (Rept. no. DM-61-108; RNM 61-10)
(Contract NOw 61-0161-c)
Unclassified report

DESCRIPTORS: *Rocket motor nozzles, Coatings, Rocket motors, Graphite, Pyrolysis, Production, Refractory materials, Materials, Processing.

Preliminary runs to determine optimum operating parameters for producing subscale test nozzle inserts for Allegany Ballistics Laboratory have been completed. Production runs to produce hardware are still underway. Dimensional inspection and non-destructive testing of two full scale second stage Polaris nozzle inserts have been completed. (Author)

Division 28-PSYCHOLOGY AND HUMAN ENGINEERING

28. PSYCHOLOGY AND HUMAN ENGINEERING

AD-255 015 Div. 28, 23
(27 Apr 61) OTS price $2.60

American Institute for Research, Washington, D. C.
SITUATIONAL PROBLEMS FOR LEADERSHIP TRAINING: PART IV. CATEGORIZED BIBLIOGRAPHY OF LEADERSHIP RESEARCH LITERATURE.
Final rept. Mar 61, 22p. 312 refs. (Rept. no. AIR-B98-61-FR-253, vol. 4)
(Contract Nonr-283800)
Unclassified report

DESCRIPTORS: *Leadership, *Training, Tests, Test methods, *Bibliography, *Behavior, *Military training.

AD-225 140 Div. 28
(4 May 61) OTS price $2.60.

Louisiana State U., Baton Rouge.
BEHAVIOR IN GROUPS. REACTIONS TO ''12 ANGRY MEN'' AS A MEASURE OF SENSITIVITY TRAINING,
by Bernard M. Bass. Mar 61, 21p. incl. illus. tables. (Technical rept. no. 26)
(Contract N7onr-35609)
Unclassified report

DESCRIPTORS: *Reaction (Psychology), *Group dynamics, Sensitivity, Behavior, Tests, Reliability, Statistical analysis, *Training, *Leadership, *Psychometrics, Training devices, Professional personnel.

A sentence completion film reaction test was developed to detect sensitivity to interpersonal phenomena. The examination has a test-retest reliability of .71. Performance on the test is significantly increased as a consequence of a management training laboratory. The scores match opinions of peers and staff psychologist's appraisals. Sensitivity scores correlate significantly with influence in small group discussions, but not necessarily with job status in one's organization. Young engineers appear to earn particularly low scores. Sensitivity scores seem to bear little relation to whether the individual is self, interaction or task-oriented in groups. (Author)

AD-255 141 Div. 28, 23
(4 May 61) OTS price $10.50.

Louisana State U., Baton Rouge.
BEHAVIOR IN GROUPS. EXPERIMENTING WITH SIMULATED MANUFACTURING ORGANIZATIONS,
by Bernard M. Bass. Mar 61, 139p. incl. illus. tables, 19 refs. (Technical rept. no. 27)
(Contract N7onr-35609)
Unclassified report

DESCRIPTORS: *Group dynamics, *Behavior, Job analysis, *Management engineering, Wages, Needs, Production, Simulation, Industry, Economics, Industrial relations, Selection, Industrial psychology, Industrial production, Personality, Training.

Contents:
Introduction
Rules of the traditional formal organization
Inefficiencies of formal organization
Satisfaction with current organization
Methods for the comparative study of formal organizations
Planning the model
Competition
Reducing interaction potential by rule
Tangible products
Planning and production
An industrial climate
Towards simulating a producing organization
The porthole production exercise
Comparison of a simpler with a more complex line-staff organization
Comparison of a line-staff organization with a formal system of overlapping committees.

AD-255 149 Div. 28
(4 May 61) OTS price $1.60

Antioch Coll., Yellow Springs, Ohio.
JUDGMENTS OF THE RELATIVE FREQUENCY OF TWO RANDOM SEQUENTIAL EVENTS: EFFECTS OF RATE OF PRESENTATION,
by Dwight E. Erlick. Rept. on Psychological Research on Human Performance. Mar 61, 8p. incl. illus. tables.
(Contract AF 33(616)6095, Proj. 6190)
(WADD TR 60-714) Unclassified report

DESCRIPTORS: Psychology, *Reasoning, Theory, *Perception, Sequences.

The effect of presentation rate on a man's ability to determine which of two mutually exclusive random sequential events has occurred more frequently was investigated using rates of one, two, four and eight events per second. Two specific studies were carried out using the same relative differential frequencies between the events but varying the absolute number of events in the total series. The results indicate that the accuracy of perceiving the more frequent event decreases as the presentation rate of the events increases. The effect of rate also acted differently for a short and long series of events; as presentation rate increased, a short series of events showed a significantly steeper decline in accuracy than a long series of events. (Author)

AD-255 232 Div. 28, 33
(4 May 61) OTS price $2.60

Aviation Psychology Lab., Ohio State U. Research Foundation, Columbus.
SOME SOURCES OF LOAD AND CONSTRAINTS ON OPERATOR PERFORMANCE IN A SIMULATED RADAR AIR TRAFFIC CONTROL TASK,
by J. S. Kidd. Mar 61, 15p. incl. illus. tables, 12 refs.
(Contract AF 33(616)6166, Proj. 7184)
(WADD TR 60-612) Unclassified report

DESCRIPTORS: *Human engineering, Simulation, *Air traffic control systems, Radar, Tests, Statistical analysis.

Two general factors relevant to human performance in a man-machine system were subjected to experimental analysis: (1) the influence of task load on operator capacity and (2) the effects of situational constraints on operator adaptability. Four variables, traffic input rate, control zone area, control team organization, and arrival sequencing procedures, were manipulated. Results from the observation of six 2-man teams indicated that physically defined constraints were more detrimental than those imposed by rules or organization structure. Procedures intended to enhance performance which depend on operator predictions or anticipations were observed to have a limited utility. Under high load stress, operator's actions seemed entirely determined by the immediate circumstances. (Author)

AD-255 233 Div. 28, 6
(4 May 61) OTS price $2.60

Aviation Psychology Lab., Ohio State U. Research Foundation, Columbus.
THE INFLUENCE OF OVERLAY CONFIGURATION ON THE ESTIMATION OF HEADING AND SPEED,
by Stanley M. Moss, Conrad L. Kraft, and William C. Howell. Mar 61, 19p. incl. illus. tables.
(Contract AF 33(616)6166, Proj. 7184; Continuation of Contract AF 33(616)3612)
(WADD TR 61-141) Unclassified report

DESCRIPTORS: *Plan position indicators, Configuration, *Reasoning, Display systems, Target lead indicators, Reaction (Psychology), Target position indicators, Coding.

Two experiments were undertaken to determine the influence of PPI overlay configurations on judgments of target heading and speed. In both studies the overlay conditions were: clear display, range rings, angle marks, and range rings with angle marks. Additional variables in Experiment I (heading judgment) were target speed (two lengths of lead or trail) and method of displaying speed (lead vs. trail coding). In Experiment II (speed judgment), additional variables included speed range and separation of standard and comparison stimuli. Twenty subjects served in Experiment I and nine in Experiment II. All configurations were presented in random sequence using a filmstrip projector; rate of presentation was controlled by the subject. Response time and error scores were recorded. Heading estimation improved and speed estimation suffered when angle marks were present. Range rings had little effect on either judgment. Trail coding led to more accurate, although less rapid, heading judgments than lead coding. (Author)

AD-255 457 Div. 28, 18, 30
(8 May 61) OTS price $8.60

Dunlap and Associates, Inc., Stamford, Conn.
HUMAN DECISION MAKING AS RELATED TO AIR SURVEILLANCE SYSTEMS,
by Andrew P. Chenzoff, Richard M. Crittenden and others. Final rept. 31 Dec 60, 88p. 45 refs.
(DA rept. no. 300-3)
(Contract AF 19(604)6164)
(AFCCDD TR 61-9) Unclassified report

DESCRIPTORS: *Aerial reconnaissance, *Reasoning, Research program administration, Military research, Man, Personality, Stress (Psychology), Group dynamics, Automation, Display systems, *Computers, Programming, Mathematical prediction, Data processing systems.

This final report (1) summarizes and brings up to date a literature survey, and relates gaps in the literature to a recommended program of research; (2) describes the implications of the systems survey for the recommended program of research; (3) describes analyst-programmer decision tasks in future systems and their research implications; (4) describes the preliminary experimental work conducted under this contract and the directions in which it should be expanded; and (5) enumerates the topics for research that have been suggested by the work to date. (Author)

AD-255 518 Div. 28
(11 May 61) OTS price $9.10

Applied Psychological Services, Wayne, Pa.
TECHNIQUES FOR EVALUATING OPERATOR LOADING IN MAN-MACHINE SYSTEMS. A MODEL FOR DIGITAL SIMULATION OF ONE AND TWO-OPERATOR MAN-MACHINE SYSTEMS,
by Arthur I. Siegel, J. Jay Wolf, and Kenneth Crain. Mar 61, 96p. incl. illus. tables, 13 refs.
(Contract Nonr-249200)
Unclassified report

DESCRIPTORS: *Human engineering, Loading, *Applied psychology, Stress (Psychology), Computers, Design, Business machine operators, Simulation, Feedback, Refueling in flight, Flight simulators, Digital computers.

The extension of a model, which had as its aim the prediction of the effectiveness of uni-operator man-machine systems, to simulate two-operator systems is described. The two-operator model may also be employed for evaluating uni-operator systems. A high speed digital computer is used to calculate and record simulated operator performance data for every action of each operator and to yield an indication of system effectiveness on the basis of these simulations. After development, the model was applied to the simulation of in-flight refueling of an F8U receiver aircraft by an A4D tanker aircraft. The maneuvers and actions of the F8U pilot during approach and probe insertion as well as the concomitant actions of the tanker aircraft pilot during this flight task were simulated. The results from the model as reflected through the digital simulation were compared with empirical criterion data on actual in-flight refueling success and were further evaluated on the basis of their compatibility with logical expectation. The results from this initial application of the model, appear to conform with reality and are generally reasonable. (Author)

AD-255 580 Div. 28, 23
(8 May 61) OTS price $1.60

Psychological Research Associates, Arlington, Va.
A REVIEW OF RESEARCH ON PERSONNEL EVALUATION TOOLS FOR THE SAGE SYSTEM,
by Melvin R. Marks. 24 Apr 61, 14p. (PRA rept. no. 61-6)
(Contract AF 19(604)5616)
(ESD TN 61-49) Unclassified report

DESCRIPTORS: *Aviation personnel, Standards, *Achievement tests, *Guided missile personnel, Effectiveness, Statistical analysis, Ground controlled interception systems, Automation, Aircraft defense systems.

The role of personnel evaluation in command and control systems in terms of R & D work is summarized. Studies are discussed which involve paper-and-pencil tests, performance tests and ratings as potential techniques. Particular attention is given to at-the-console performance tests. On the basis of the research evidence it appears that performance tests: (1) place incumbents in an order-of-merit which closely approximates the order-of-merit in the working job situation; (2) provide a yardstick on which minimum job performance standards may be specified; (3) are a means for detecting, troubleshooting, repairing and/or replacing malfunctioning human components; (4) are a possible vehicle for conducting certain remedial training; (5) can be developed economically and rapidly for SAGE, within the present state-of-the-art; (6) are highly acceptable to the tested personnel; and (7) can be administered and used by AF personnel on an in-service basis. It is concluded

that performance tests are the personnel evaluation method of choice. A program for their development in the SAGE System would be an effective means for increasing system effectiveness. (Author)

AD-255 581 Div. 28, 23
(8 May 61) OTS price $4.60

Psychological Research Associates, Inc., Arlington, Va.
PERFORMANCE TEST DEVELOPMENT FOR THE INITIATION SUPERVISOR/TRACK INITIATOR POSITIONS IN SAGE,
by Melvin R. Marks, Kenneth A. Lawrence, and George A. Warburton. Apr 61, 38p. incl. illus. tables, 11 refs. (PRA rept. no. 61-7)
(Contract AF 19(604)5616)
(ESD TN 61-48) Unclassified report

DESCRIPTORS: *Achievement tests, Design, *Aviation personnel, Statistical analysis, *Guided missile personnel, Automation, Ground controlled interception systems, Analysis of variance, Test methods, Reliability, Aircraft defense systems.

This report describes the development, administration and analysis of individual at-the-console performance tests for the positions of Track Initiator and Initiation Supervisor in the SAGE System. The tests were shown to be independent of sector geography, reliable, valid and acceptable to operating personnel. It appears that a test development program based on these tests as prototypes is feasible. (Author)

AD-255 682 Div. 28
(9 May 61) OTS price $2.60

Electric Boat Div., General Dynamics Corp., Groton, Conn.
TRANSFER OF TRAINING AS A FUNCTION OF TASK DIFFICULTY IN A COMPLEX CONTROL SITUATION,
by Donald A. Goldstein and John M. Newton. Technical rept. 12 Jan 61, 16p. incl. illus. tables.
(Rept. no. U411-61-007)
(Contract Nonr-307500)
Unclassified report

DESCRIPTORS: *Transfer of training, *Training, Perception, Tests, Depth finding, Statistical analysis, Submarine hulls, Velocity, Submarines, Control, *Control systems, Tracking, Submarine personnel, Training devices, Effectiveness.

Two submarines, differing with respect to their dynamic response characteristics as a function of differences in hull size, were simulated at each of two speeds (slow and fast). Four groups of 20 subjects were trained on a depth-keeping task, one group on each of 4 hull-speed combinations. Following training, 3 subgroups of 5 subjects from each group were tested on the other 3 hull-speed conditions, with the remaining 5 subjects tested on the same system. This was done to determine the degree to which training on any 1 of the 4 systems transfers to the other 3 systems. It was found that, on the basis of mean time on target scores per five-trial block, the more difficult systems to control were those with the longer control lags. These were the small hull at slow speed and large hull at slow systems. It was also found that training on the most difficult control system, the large hull at slow speed system, produced generally better transfer effects than did training on any other system. (Author)

AD-255 683 Div. 28
(9 May 61) OTS price $3.60

Electric Boat Div., General Dynamics Corp., Groton, Conn.
LINEAR QUICKENING AS GUIDANCE IN TRAINING FOR MANUAL CONTROL OF COMPLEX SYSTEMS,
by Donald A. Goldstein. Technical rept. 3 Mar 61. 1v. incl. illus. tables. (Rept. no. U411-61-053)
(Contract Nonr-307500)
Unclassified report

DESCRIPTORS: *Training, *Transfer of training, Perception, Tests, Reaction (Psychology), Control, Submarines, *Control systems, Tracking, Display systems, Statistical analysis, Submarine personnel, Training devices, Effectiveness.

An attempt was made to determine the effectiveness of linear quickening as guidance in training for manual (unaided) control of complex systems. The experimental task performed by all subjects was somewhat analogous to a submarine depth-changing maneuver to the extent that it represented changing the status of a complex system. To provide guidance to the experimental groups, the task system was quickened on some of the training trials. Five experimental groups of 10 subjects were used. These groups differed with respect to the number and position of quickened trials received during an eighteen-trial training series. A sixth group of 10 subjects served as a control and received no quickened training trials. Following training, all groups were given 6 test trials on an unquickened system. Using time on target scores for the six test trials, it was found that: (1) quickened training as guidance was not as effective as practice on the unquickened system itself, (2) the worst performance was exhibited by that group receiving quickened training only, and (3) performance was not significantly affected by the position in the training series in which quickening was introduced. (Author)

AD-255 866 Div. 28, 23
(3 May 61) OTS price $2.60

Bureau of Naval Personnel, Washington, D. C.
PREDICTION OF OCS ACADEMIC GRADES AND POST-OCS PERFORMANCE OF JUNIOR OFFICERS WITH A BATTERY OF SPEEDED TESTS,
by Leonard Wallack and Isaiah Guttman. Jan 61, 9p. tables (Technical bull. no. 61-2)
Unclassified report

DESCRIPTORS: *Naval personnel, Leadership, *Officer personnel, *Aptitude tests, Effectiveness, Selection.

This study tested the hypothesis that a speed factor may be used to predict (1) OCS academic grades, and (2) post-OCS performance of junior officers. Ten experimental speeded tests were used as predictors, along with three experimental reference tests which served as control variables. There were two criteria. The first was OCS academic grades, and the second consisted of Officer Fitness Reports (OFR) and Junior Officer Activity Checklists (JOAC). The sample for the first criterion consisted of 132 and 273 officer candidates in OCS classes 37 and 38, respectively. Results showed that speeded tests did not consistently add to the prediction of OCS academic grades. The sample for the second criterion was divided into two groups--junior officers in fleet billets (N=108) and those in shore billets (N=81). Re-

sults of the study for the fleet billet group showed that speeded tests did not predict post-OCS performance. A non-speeded variable, Peer Ratings, did predict OFR, albeit only to a moderate extent. None of the tested variables predicted performance at shore billets. (Author)

AD-255 867 Div. 28, 23
(3 May 61) OTS price $2.60

Bureau of Naval Personnel, Washington, D. C.
ANALYSIS OF RELATIVE WEIGHTS ASSIGNED TO OCS PREDICTORS AND OCS COURSE GRADES,
by John J. LaGaipa. Jan 61, 17p. incl. tables, 17 refs. (Technical bull. no. 61-3)
Unclassified report

DESCRIPTORS: *Naval personnel, Leadership, *Officer personnel, *Aptitude tests, Effectiveness, Selection.

This is a report on the contributions: (1) of current OC selection measures to the prediction of OCS success and subsequent duty performance, and (2) of OCS grades to the prediction of subsequent duty performance. Validity data were obtained on OCS Classes 34 and 35. One year after graduation, evaluations of duty performance were obtained, using Fitness Reports and the Junior Officer Activity Checklists. The OC selection variables did not predict on-the-job success as measured by the Fitness Reports or the JOAC scores in the year after graduation. Furthermore, none of the OCS academic course grades contributed to the prediction of subsequent duty performance. However, Military Aptitude ratings did predict duty performance of officers in sea billets. Thus, authoritative judgment should be expressed in determining whether proportionately greater weight ought to be given to Military Aptitude, as compared to academic subjects, in determining final class standing. (Author)

AD-255 903 Div. 28, 26
(15 May 61) OTS price $2.60

Institute for Social Research, U. of Michigan, Ann Arbor.
ORGANIZATIONAL ATMOSPHERE, AS RELATED TO TYPES OF MOTIVES AND LEVELS OF OUTPUT,
by Donald C. Pelz and Frank M. Andrews. Interim technical rept. (Analysis memo. no. 9) on Stimulating and Inhibiting Factors in Scientific Performance; Partial Support. 15 Apr 61, 1v.
(Grant no. DA ORD-31-124-61-G18)
(OOR rept. no. 0010:3) Unclassified report

DESCRIPTORS: *Needs, Management engineering, *Group dynamics, Production, Personality, Laboratories, Adjustment (Psychology), Applied psychology, *Employee relations, *Sociometrics.

Patterns of motives and of scientific products were examined to see whether these differed depending on the organizational atmosphere, and whether it would be feasible (for purposes of analysis) to group together laboratories sharing the same atmosphere but differing in location (government, industry, university). Government development laboratories were found to differ from government research laboratories, the latter resembling university scientists in patterns of motives and products. Among development laboratories (industrial and government) some distinct differences in motives and in products appeared between those emphasizing accumulation or restructuring of knowledge. But the differences were not such as to justify the combination of departments scoring alike on atmosphere but differing in location. For non-doctoral scientists, the dimensions of atmosphere made less difference, either in terms of motives or products. (Author)

29. QUARTERMASTER EQUIPMENT AND SUPPLIES

AD-254 980 Div. 29, 3, 16
(1 May 61) OTS price $5.60

Technical Operations, Inc., Burlington, Mass.
PROTECTIVE CLOTHING AND COMBAT EFFECTIVENESS,
by D. Schimelfenyg, N. Donnelly, and F. C. Brooks. 31 Jan 61, 48p. incl. illus. tables.
(Rept. no. TO-B 61-8)
(Contract DA 19-129-qm-1513, Proj. 7-79-10-002)
(Clothing Branch Series rept. no. 20)
Unclassified report

DESCRIPTORS: *Protective clothing, Thermal insulation, Climatic factors, Radiological warfare, Combat, Effectiveness, Thermal radiation, Chemical warfare agents, *Heat tolerance, Chemical warfare, G agents, Physiology.

A quantitative method is presented for comparing the combat effectiveness of soldiers as a function of the clothing and personal equipment provided them. Both the weapons' protection and the adverse physiological effects resulting from protective clothing are analyzed in relation to both weapon environment and natural environment. The proposed method requires specific data on lethal areas of weapons used against soldiers with varying degrees of clothing protection, on tolerance times as a function of activity in various clothing ensembles, and on the frequency and duration of military tasks. A specific conclusion is that thermal protection is less effective for front-line troops than for rear-echelon troops. (Author)

AD-255 164 Div. 29, 16
(2 May 61) OTS Price $2.60

Tokugawa Inst. for Biological Research (Japan).
CHEMICAL COMPOSITION AND APPLICABILITY AS FOOD AND FEED OF MASS-CULTURED UNICELLULAR ALGAE,
by Hiroshi Tamiya. Final rept. no. 1, 18 Jan 60-17 Jan 61. 17 Jan 61, 21p. incl. tables, 11 refs.
(Contract DA 92-557-FEC-33129)
Unclassified report

DESCRIPTORS: *Algae, Chemistry, *Nutrition, Dehydrated substances, Diet, Growth, Proteins, Methanols, Animals, *Food, Chemical analysis, Man.

Mass-cultured Chlorella cells were processed in various ways, and the samples were compared for their chemical composition, digestibility, as well as for their nutritive value in supporting growth of young rats, rabbits and chicks. When tested with rats, the blanced and methanol-treated samples showed better digestibility than the spray - or vacuum - dried samples. When

administered to human beings (30 g per day), the blanched and methanol-treated samples were digested by 75 and 86% repspectively. In rat-growing test, the diet containing methanol-treated alga (26%) proved to be almost equivalent to the diet containing 43% skim milk, whereas the diet containing spray-dried alga (30%) gave a considerably inferior result. The best results were obtained with a diet containing 10% methanol-treated alga and 82% wheat flour, the weight gain of rats in 100 days being 50% higher than that with the skim milk diet. The spray-dried alga appeared to be better assimilated by rabbits and chicks than by rats, although the rabbits fed on the algal diet began to lose hair after about 4 weeks of feeding. When given to adult hens, the feed containing spray-dried alga showed a promoting effect upon the egg-productivity , the eggs being somewhat smaller in size, but having an egg yolk of the same or even greater weight compared with those of the control eggs. (Author)

AD-255 343 Div. 29
(5 May 61) OTS price $4.60

4750th Test Squadron (Tactics and Application Engineering) Tyndall Air Force Base, Fla.
COMPARATIVE TEST OF AIRCREW PRESSURE SUITS,
by Norman R. Smedes. 1 Apr 61, 49p. incl. illus. tables.
(Proj. ADC/73AD/60-11)
Unclassified report

DESCRIPTORS: *Pressure suits, Aviation personnel, High altitude, Tests, Exposure.

In an effort to determine which type of high altitude aircrew pressure suit best fulfilled the requirements of the Air Defense Command, a comparative test was conducted on four types of pressure suits: A/P-22S-2, A/P-22S-3 full pressure suits, and CSU-4P, CSU-5/P partial pressure suits. The A/P-22S-2 full pressure suit proved to be the most acceptable garmet of the four tested. This full pressure suit satisfied the prerequisites of the mission completion concept as advocated by ADC. The A/P-22S-2 suit also provided adequate aircrew protection as a land or water anti-exposure garment. The high altitude capabilities of this garment were tested in normal and simulated emergency flight conditions. The anti-exposure features of the suit were tested in cold land and cold water environments. It is concluded that, of the four pressure suits tested, the A/P-22S-2 full pressure suit most nearly satisfies the operational requirement of ADC. (Author)

AD-255 690 Div. 29, 14, 25
(10 May 61) OTS price $9.60

Little, Arthur D., Inc., Cambridge, Mass.
DEVELOPMENT OF A MEANS TO NEUTRALIZE INTENSE THERMAL RADIATION.
Final rept. Jan 58-Sep 60. 31 Oct 60, 104p. incl. illus. tables, 24 refs.
(Contract DA 19-129-qm-1087)
Unclassified report

DESCRIPTORS: *Thermal radiation, Countermeasures, Solar furnaces, *Protective clothing, Effectiveness, Materials, *Thermal insulation, Foams, Metal organic compounds, *Heat transfer, Additives, Radiation damage, Insulating materials, Smokes, Measurement, Nuclear explosions, Atomic bomb explosions, Reaction kinetics, Thermodynamics, Test equipment, Test methods, Expanded plastics, *High temperature research, Textiles, Plastics.

An evaluation was made of 5 approaches for neutralizing radiant thermal energy incident upon the outer layer of a clothing system: (1) utilization of foam formation; (2) utilization of heats of reaction; (3) utilization of heats of fusion and vaporization; (4) attenuation of incident radiation through the production of smoke or fog; and (5) utilization of sublimation. Most of the tests were performed in a solar furnace, since the spectral distribution of radiation from the sun closely approximates that from an atomic explosion. A carbon arc was used during instances of adverse weather. Theoretical analyses were made of the laws of transient heat flow to get some indication of the relative importance of endothermy, emissivity, and thermal conductivity in providing protection. Of the 5 approaches, smoke screens had the greatest potential. Materials that sublimed readily to provide dense protective smoke layers included ferrocene and related organo metallics, the metal acetonates, camphor, and the anthraquinone derivatives.

30. RESEARCH AND RESEARCH EQUIPMENT

AD-255 070 Div. 30
(3 May 61) OTS price $7.60.

Ohio Semiconductors, Inc., Columbus.
APPLICATION OF THE HALL EFFECT TO BASIC MEASUREMENTS,
by N. P. Milligan and R. W. Crawford. Final rept. 16 Jan 61, 70p. incl. illus. 25 refs.
(Rept. no. A400-4)
(Contract AF 30(602)2237)
(RADC TR 61-53) Unclassified report

DESCRIPTORS: *Hall effect, Measurement, Waveguides, *Radiofrequency power, Power meters, Microwave frequency, *Ammeters, *Laboratory equipment, Theory, Design, Electronic circuits, Electric currents, Tests.

A study was made of the practicability of utilizing the Hall effect for making two specific types of basic measurements, namely for measurement of current in a conductor and the measurement of microwave power in a waveguide. As a result of the study, a laboratory model of a D. C. Hall effect milliammeter with range of 5-0-5 ma, 50-0-50 ma, and 500-0-500 ma was successfully constructed. Methods of overcoming such problems as drift, ohmic unbalance in the Hall probe and spurious magnetic fields are discussed. The basic theory relating to the use of the Hall effect as a microwave power meter is reviewed. Details of the experimental data taken with InAs and Ge probes are discussed. Data showing that a power meter for specific load conditions can be constructed are shown. The large magnitude of the output voltage from the Hall element casts doubt on its being a Hall voltage. An hypothesis discussing the possibility of the output voltage arising from the Seebeck Effect is forwarded. A recommendation is made that a Hall assembly containing no junctions in the waveguide be fabricated. This ''junctionless'' assembly could be used in future work to prove or disprove the presence of the Seebeck voltage. (Author)

AD-255 086 Div. 30, 5
(8 May 61) OTS price $4.60.

Lincoln Lab., Mass. Inst. of Tech., Lexington.
REMOTE DISPLAY CONSOLE FOR COMPUTER PROCESSED DATA,
by H. E. Ziegan and D. I. Underwood. 13 Jan 61, 46p. incl. illus. (Technical rept. no. 237)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Display systems, Memory devices, *Ferrite cores, *Digital computers, *Digital systems, Data storage systems, *Data transmission systems, Coding, Cathode ray tubes,

The remote display console simulates an FSQ-7 situation display but can be located remotely from the processing computer with only a telephone-line or radio-link connection. The system has a 1300-cps, 92-bit message format which permits the transmission of approximately 14 messages/sec. A ferrite core memory stores 62 of these messages, each of which can consist of 4, 8, or 13 symbols. The console is completely self-contained except for the digital data receiver, which would normally be supplied by the telephone company. At 50 frames/sec the display is essentially flicker free and bright enough to be viewed comfortably in a well-lighted room. The tube used provides a resolution equivalent to 5000 to 8000 TV lines and presents negligible distortion of symbols to the extreme edges of the 19-in. tube. (Author)

AD-255 110 Div. 30, 17, 20
(2 May 61) OTS price $1.10

Kaman Nuclear, Colorado Springs, Colo.
DEVELOPMENT AND FABRICATION OF NON-DESTRUCTIVE SPECIFIC GRAVITY MEASURING EQUIPMENT EMPLOYING RADIATION TECHNIQUE.
Monthly progress rept. 1-28 Feb 61. 28 Feb 61. 5p. illus. (Rept. no. 58-92-PR-30)
(Contract DA 19-059-501-ORD-2631, Proj. TA2-8051)
Unclassified report

DESCRIPTORS: *Non-destructive testing, Density, Design, Measurement, Test equipment, Radioactivity, Gamma rays, *Density sensitive indicators, Radiographic analysis, Radiation instruments, Physical properties.

AD-255 220 Div. 30, 17, 20
(2 May 61) OTS price $1.10

Kaman Aircraft Corp., Bloomfield, Conn.
DEVELOPMENT AND FABRICATION OF NON-DESTRUCTIVE SPECIFIC GRAVITY MEASURING EQUIPMENT EMPLOYING RADIATION TECHNIQUE.
Monthly progress rept. no. 29, 1-31 Jan 61. Jan 61, 4p. (Rept. no. 58-92-PR-29)
(Contract DA 19-059-501-ORD-2631, Proj. TA2-8051)
Unclassified report

DESCRIPTORS: *Non-destructive testing, Design, Density, Measurement, Radioactivity, Test equipment, Gamma rays, Density sensitive indicators, Radiographic analysis, Radiation instruments, Physical properties.

AD-255 324 Div. 30, 25, 27
(5 May 61) OTS price $3.60

Technik, Inc., Garden City, N. Y.
ANALYSIS OF THRUST MEASURING DEVICES FOR PULSE SYSTEMS,
by Melvin Zaid, Nov 60, 35p. incl. illus.
(Rept. no. PPL-TR-60-17)
(Subcontract to Republic Aviation Corp., Farmingdale, N. Y., Contract Nonr-285100)
Unclassified report

DESCRIPTORS: *Pulsejet engines, *Thrust, Rocket motors, Rocket propulsion, Analysis, Instrumentation, Measurement.

Contents:
Introduction
Statement of problem
General equations
General systems
Infinitely rigid systems
Infinitely flexible systems
Intermediate stiffness systems
Intermediate stiffness systems - detailed investigations
Soft system
Static analysis
Dynamic analysis
Pivot buckling considerations
Sources of erratic behavior
Stiff systems
Dynamic analysis
Sources of erratic behavior

AD-255 327 Div. 30, 9
(5 May 61) OTS price $5.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
WIND TUNNEL FACILITIES AT THE JET PROPULSION LABORATORY,
by G. G. Goranson and H. D. Strong. 18 Apr 61, 1v. incl. illus. (Technical release no. 34-257)
(Contract NASw-6)
Unclassified report

DESCRIPTORS: *Wind tunnels, Laboratories, *Test facilities, Test methods, Model tests, Test equipment, Digital computers, Wind tunnel nozzles, Calibration, Instrumentation, Aerodynamics, *Hypersonic wind tunnels, *Supersonic wind tunnels, Tests.

The wind tunnel facilities presently available at JPL for NASA and military-service testing purposes are described. The wind tunnel facilities include a 20-in. supersonic wind tunnel (SWT) with a Mach-number range of 1.3 to 5.6 and a 21-in. hypersonic wind tunnel (HWT) with a Mach-number range of 4.1 to 11.0. The geometric size of the 20-in. SWT test section is 18-in. wide by 20-in. high, while the 21-in. HWT has a test section which is 21 inches wide at the downstream end (the side walls each diverge at about 1/2 deg) and 15 to 28-in. high (adjustable). Both wind tunnels are of the continuous-flow, variable-density type and each utilizes a two-dimensional flexible nozzle which can provide an infinite choice of test-section Mach numbers within a specified range. (Author)

AD-255 329 Div. 30
(5 May 61) OTS price $6.60

Land-Air, Inc., Point Mugu, Calif.
COMPUTER PROGRAMMING FOR REAL TIME. IMPACT PREDICTION AND DESTRUCT CONTROL,
ed. by C. E. Black. 31 Mar 61, 59p. incl. illus. tables. (Rept. no. 26)
(Contract N-123(61756)19425A)
Unclassified report

DESCRIPTORS: *Radar range computers, Radar, *Programming, *Impact computers, Computers, Voice communication systems, Digital computers.

The computer program accepts data from three input sources simultaneously: (1) polar coordinates from one radar; (2) direction cosines alpha and beta from a cotar, the foregoing at 20 samples per second; and (3) polar coordinates from a second radar at 8.13 samples per second. The program computes from two input systems: (1) A choice of (a) the combination of cotar angles and radar range, or (b) polar coordinates from the radar alone; and (2) polar coordinates from the second radar. The program respects the primacy of one input system over the other where the operator indicates the primary system. Data from both systems are edited. Position is computed, smoothed velocity components are computed and compared with a tolerance. The complete logic considers the edit results and the results from the various comparisons for choosing input to routines for predicting the location of the missile impact point and for recognizing criteria for destroying the missile. (Author)

AD-255 344 Div. 30, 8
(15 May 61) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
DI-PULSE LOGIC,
by Kenneth E. Perry. 25 June 59, 4p. illus.
(Group rept. no. 52-7)
(Contract AF 19(604)5200)
Unclassified report

DESCRIPTORS: *Digital computers, Diodes, Mathematical logic, Low pass filters, Circuits, *Trigger circuits, Transistors, *Electronic circuits.

AD-255 408 Div. 30, 8
(4 May 61) OTS price $5.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
RADIO MEASUREMENTS IN MILLIMETER WAVELENGTHS (Radioizmereniya Na Millimetrovykh Volnakh),
by G. D. Burdun, R. A. Valitov and others.
Dec 60, 49p. (Trans. no. MCL-646)
Unclassified report

DESCRIPTORS: *Radiofrequency power, USSR, Microwave frequency, Measurement, Pressure, Calorimeters, Bolometers, Electromagnetic waves, Thermistors, Waveguides, Power meters.

Contents:
Methods and devices for power measurement
Classification of power-measuring devices
Calorimeters for power measurement
Thermistor- and bolometer-type power measuring devices
Enthrakometers
Application of the ponderomotive effect of electromagnetic waves for microwave power measurement
Ponderomotive power-measuring devices based on electromagnetic wave pressure on the walls of a waveguide, coaxial line or cavity
Ponderomotive power-measuring devices based on the pressure of electromagnetic waves on reflecting elements inserted within a waveguide or cavity resonator
Ponderomotive dielectric constant meters

AD-255 434 Div. 30, 15
(7 May 61) OTS price $5.60.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
AN ORDVAC PROGRAM FOR THE TRANSFORMATION OF GEODETIC ELLIPSOIDAL COORDINATES INTO CARTESIAN COORDINATES AND VICE VERSA,
by A. Roberta Wooten. Feb 61, 59p. incl. illus.
(BRL memo. rept. no. 1322)
(Proj. 503-06-011)
Unclassified report

DESCRIPTORS: *Digital computers, *Programming, Transformations (Mathematics), Ellipsoids,

The transformation of geodetic ellipsoidal coordinates into Cartesian coordinates and vice versa is programmed for the ORDVAC using a pseudo code - The One Address Floating Binary Double Precision Code (OFBDP). (Author)

AD-255 563 Div. 30, 9
(11 May 61) OTS price $5.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
VON KARMAN GAS DYNAMICS FACILITY.
1961, 53p. incl. illus. table.
Unclassified report

DESCRIPTORS: Wind tunnels, *Supersonic wind tunnels, *Hypersonic wind tunnels, *Aeronautical laboratories, *Test facilities, Instrumentation.

Design, operation, organization structure, facility layout, and performance parameters of the Von Karman Gas Dynamics Facility at AEDC are discussed. The facility is engaged in aerodynamic development testing and research in the supersonic and hypersonic Mach number ranges. The existing units cover the Mach spectrum from 1.5 to 21.0, and include: (1) a 40 by 40 in. supersonic unit; (2) two 50-in. diam hypersonic units; (3) a 50-in.-diam hypervelocity unit, operating in the range between Mach 16 and 21, at flow velocity of 9000 fps; and (4) a 6-in-diam, hypervelocity, low density research unit, operating at Mach 10 at flow velocity of 9000 fps. Highlights of the facility activities are discussed together with the capabilities of the various units. All associated instrumentation is described.

AD-255 579 Div. 30, 17, 20
(9 May 61) OTS price $1.60

Kaman Nuclear, Colorado Springs, Colo.
DEVELOPMENT AND FABRICATION OF NON-DESTRUCTIVE SPECIFIC GRAVITY MEASURING EQUIPMENT EMPLOYING RADIATION TECHNIQUE.
Monthly progress rept. no. 28, 1-31 Dec 60, 31 Dec 60, 13p. incl. illus. (Rept. no. 58-92-PR-28)
(Contract DA 19-059-501-ORD-2631, Proj. TA2-8051)
Unclassified report

DESCRIPTORS: *Non-destructive testing, Design, Density, Measurement, Radioactivity, Test equipment, Gamma rays, Radiation instruments, Physical properties, Radiographic analysis, *Density sensitive indicators.

Revision and checking were conducted on the length probe system. A calculator with greater storage capacity than the calculator being employed was sought to fulfill the requirement that the densitometer provide average sample density data.

AD-255 656 Div. 30, 15
(10 May 61) OTS price $1.60

Applied Mathematics and Statistics Lab., Stanford U., Calif.
ALGOL 60 PROCEDURES FOR RANGE ARITHMETIC,
by Allan Gibb. 12 Apr 61, 9p. (Technical rept. no. 10)
(Contract Nonr-22537, Proj. NR-044-211)
Unclassified report

DESCRIPTORS: Computers, *Digital computers, *Programming, Statistical analysis, Errors, Statistical distributions, Mathematics.

AD-255 663 Div. 30, 22, 25
(10 May 61) OTS price $6.60

Air Force Cambridge Research Labs., Bedford, Mass.
THERMAL RADIATION MEASUREMENTS FROM AN AEROBEE-HI RESEARCH ROCKET,
by R. E. Hunter and R. G. Walker. Dec 60, 55p. incl. illus. (GRD Research notes no. 34; AFCRL TN 60-403)
Unclassified report

DESCRIPTORS: *Radiometers, Instrumentation, Airborne, *Sounding rockets, Exhaust gases, Transistors, Infrared spectroscopy, Sulfides, Lead compounds, Infrared detectors, Carbon dioxide, Bolometers, *Thermal radiation, Calibration, Measurement, Transmission.

A series of small rocketborne radiometers and spectrometers were installed for one static firing and two launchings aboard Aerobee-Hi research rockets. Performance characteristics were determined and are discussed, plus design requirements for advanced instrumentation. The radiating characteristics of the plume were measured as a function of altitude, and the plume spectral radiance and modulation spectra are presented. (Author)

AD-255 698 Div. 30, 8, 25
(11 May 61) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
TECHNIQUES FOR PULSE TESTING MAGNETIC FILM MEMORY ELEMENTS,
by Allan H. Anderson and Thomas S. Crowther. 29 Jan 60, 1v. incl. illus. (Group rept. no. 51-11)
(Contract AF 19(604)5200)
Unclassified report

DESCRIPTORS: *Data storage systems, *Magnetic recording systems, Films, Ferromagnetic materials, Tests, Test methods, *Magnetic materials, *Memory devices.

Equipment and procedures have been developed for testing the individual magnetic film elements of an integral array. Each element is tested for switching output amplitude, digit and transverse disturb sensitivity, and skew of the easy axis. The array of magnetic film elements is mechanically indexed under a single set of drive lines and sense coil, one element being tested at a time. The individual components of a testing station, manipulator, drive lines and sense coil, pulse generators, pattern generating logic, and sense amplifier are described. The pulse testing equipment was constructed for testing 16 x 16 arrays of 1/16-in.-diam. elements on 0.100-in. centers. It has also been used, successfully, for testing individual 0.010-in.-diam. elements on 0.100-in. centers. (Author)

AD-255 721 Div. 30
(11 May 61) OTS price $2.60.

Naval Ordnance Lab., White Oak, Md.
NOL WATER-ENTRY TEST FACILITY,
by V. R. Yurow. 15 Mar 61, 17p. incl. illus. (NAVORD rept. no. 6815) Unclassified report

DESCRIPTORS: *Water entry, *Test facilities, Naval research laboratories, Instrumentation, Missile launchers, Accelerometers, Design, Motion picture photography, Impact shock, Recording devices, Underwater ordnance,

A high velocity, variable angle launcher has been placed in operation at the test pond of the Naval Ordnance Laboratory. Internally instrumented models and high speed motion picture photography are used to provide water-entry shock signatures and trajectory information. Scale and full size test vehicles up to 500 pounds in weight and 14.25 inches in diameter can be launched at velocities that range from 350 fps for a 500 pound model to 1100 fps for a 5 pound model. The report describes the facility and its operation, discusses its advantages and limitations, and summarizes the test programs conducted in the facility since its completion. (Author)

AD-255 730 Div. 30, 6
(15 May 61) OTS price $8.10

Scope, Inc., Falls Church, Va.
STUDY OF AUTOMATIC CONDITIONED REFLEX JAMMING MODE SELECTOR.
Quarterly technical note no. 4. 15 May 61, 78p. incl. illus. tables.
(Contract AF 33(616)7268, Proj. 0(670)-4040)
(ASD TN 61-62) Unclassified report

DESCRIPTORS: *Radar jamming, Countermeasures, *Memory devices, Digital computers, Digital systems, Signal-to-noise ratio, Automatic, Probability, Data storage systems, Ferrite cores, Mathematical computer data, Design, Mathematical analysis, *Mathematical logic.

An analysis of the general linear accumulation system is presented. This new analysis is valid for both uni-directional and bi-directional systems. The efficiency of the two-state linear accumulation system is strongly affected by PD. A+1,0,-1 output D-cell system is analyzed. The resulting signal-to-noise ratio is presented. Analysis of a system with binary memory showed that the loss of information was small. Binary memory offers several advantages in implementation, and a digital system (CONFLEX 1) which exploits these advantages is described. The simulation experiments showed a tendency on the part of the system to generalize on the basis of S-field position. The consequences of this are discussed and a plan to analyze this effect is formulated. (Author)

AD-255 740 Div. 30
(10 May 61) OTS price $7.60.

Sylvania Electric Products, Inc., Waltham, Mass.
FINITE BINARY SEQUENCES.
Final rept. 12 May 61, 1v. 13 refs. (Rept. no. F475-1)
(Contract AF 19(604)6639)
(AFCRL-136) Unclassified report

DESCRIPTORS: Correlation techniques, *Coding, Sequences, Special functions, Corrections, Algebra, Errors, Difference equations,

The investigation is described of the autocorrelation properties of quadratic-residue codes (of 1's and -1's), both in the periodic and aperiodic cases. In the latter case, results for 52 specific primes up to 2003 are obtained. Included also is an exposition of some work by Singer relating difference sets and maximal-length linear recursive sequences. A new proof is derived showing that the Golay error-correcting code corrects three errors. The report concludes with a detailed chapter containing new results on the error-correcting properties of Bose-Chaudhuri Codes. (Author)

AD-255 751 Div. 30, 32
(9 May 61) OTS price $10.10

Texas U., Austin.
MACHINE LANGUAGE TRANSLATION STUDY,
by E. D. Pendergraft and L. W. Tosh. Quarterly progress rept. no. 7, 1 Nov 60-31 Jan 61 on Research on the Machine Translation of German. 31 Jan 61, 1v. incl. illus.
(Contract DA 36-039-sc-78911)
Unclassified report

DESCRIPTORS: *Machine translation, Coding, Mathematical analysis, Transformations (Mathematics), Magnetic tape, Programming, Digital computers, *Language, Design.

Progress is reported toward the development of a generalized computer system to implement translation of natural languages. The system will have two major functions: (a) a utility function that will compile, verify and optimize linguistic data of specific languages for the generalized translation algorithm, and (b) a production function to carry out the translation algorithm itself. Linguistic procedures being used in the preparation of German and English data for the system are described. Two appendices of these data are included. The beginning of a program to improve the capabilities of the translation algorithm through mathematical research is explained. (Author)

AD-255 753 Div. 30, 25
(11 May 61) OTS price $5.60

Flight and Engineering Test Div., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
COMMON PARALLEL THERMOCOUPLES FOR AVERAGE TEMPERATURE MEASUREMENT,
by Bernard C. Boggs. Rept. for Feb-Apr 60 on Structural Testing of Flight Vehicles. Nov 60, 1v. incl. illus.
(Proj. 1347)
(WADD TR 60-650) Unclassified report

DESCRIPTORS: *Thermocouples, Temperature control, Aircraft, Electrical networks, Iron, Copper alloys, Nickel alloys, Test methods, Circuits, Measurement, Temperature.

The report describes the use of common parallel thermocouple circuits for temperature control in thermal simulation. Iron-constantan thermocouples were welded directly to the basic metal being heated. Structural tests at elevated temperatures show that thermocouples connected into parallel electrical circuits and grounded to a common metal sheet give the same temperature measurements as separated thermocouples connected into a parallel circuit. This method is applicable to any test situation requiring average temperatures. (Author)

AD-255 755 Div. 30, 20
(11 May 61) OTS price $1.60

Engineering Test Div., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
DESCRIPTION AND OPERATION OF A UNIVERSAL ADAPTOR FOR GENERAL MILLS AND MODEL 8 MANIPULATORS,
by Vincent L. J. Di Rito. Rept. for Nov 59-Dec 60 on Experimental and Technical Support for the Design, Construction and Operation of the Air Force NETF. Dec 60, 11p. incl. illus.
(Proj. 7001)
(WADD TN 60-305) Unclassified report

DESCRIPTORS: Adapters, Test equipment, *Test facilities, *Remote control systems, Contamination, *Laboratory equipment, *Tools, *Machine tools, Handling, Radiation hazards, *Nuclear physics laboratories, Design, Operation, Instrumentation.

The universal adaptor provides a simple and inexpensive means for converting standard commercial power tools for remote operation in a hot cell. Power tools equipped with these adaptors can be attached and held firmly by either the General Mills or the modified Model 8 manipulator. The method of attaching the tool to the arm of the manipulator is rapid so that operation is speeded up and the work accomplished is increased. Operators find the tools easy to control and change from one manipulator to the other. The modifications to the Model 8 manipulator to accommodate the adaptor do not interfere with the normal operation of the hand, but extend the capability of the device beyond that of the original design. (Author)

AD-255 757 Div. 30, 12
(10 May 61) OTS price $6.60

Air Force Missile Development Center, Holloman Air Force Base, N. Mex.
MASTER FILE OF DATA OF THE HOLLOMAN TRACK,
by Robert G. Tantzen and William G. Crehl. Technical rept. Apr 61, 63p. incl. illus. tables
(Rept. no. AFMDC TR 61-10)
Unclassified report

DESCRIPTORS: Punched card methods, Tables, *Mathematical computer data, Gravity, Data, Magnetic tape, Geodetic data, Determination, *Inertial guidance, *Tracks (Aerodynamics), Test equipment, Astronomical data.

Tests of inertial guidance systems on the Holloman Track require a precise knowledge of position and of the gravity force. This report is a compilation of all available data into one single master file and was compiled in order to establish a single source of reference as well as to create a data format which lends itself to automatic computation. The master file serves as a basis for computing data in any desired coordinate system and will be updated whenever new survey data become available. (Author)

AD-255 763 Div. 30, 9
(11 May 61) OTS price $3.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
MEASUREMENT OF THE PRESSURE FLUCTUATIONS IN THE TEST SECTION OF THE 16-FOOT TRANSONIC CIRCUIT IN THE FREQUENCY RANGE FROM 5 TO 1000 CPS,
by H. L. Chevalier and H. E. Todd. May 61, 28p. incl. illus. (Rept. no. AEDC TN 61-51)
(Contract AF 40(600)800)
Unclassified report

DESCRIPTORS: *Transonic wind tunnels, Tests, Wind tunnels, Aerodynamics, Transonics, Pressure, Acoustics, *Test facilities, Measurement, Wedges, Ogives, Wings, *Aerodynamic configurations, Transducers, Instrumentation.

An investigation was conducted in the 16-Foot Transonic Circuit of the Propulsion Wind Tunnel Facility (PWT) to determine the inherent pressure fluctuations in the test section. Test results indicate that these pressure fluctuations are well within one percent of the free-stream dynamic pressure except at Mach numbers near 0.7. The relatively larger fluctuations near Mach Number 0.7 result from a higher power spectral density in the 500 to 700 cps frequency range. (Author)

AD-255 785 Div. 30, 8
(10 May 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
MAGNETIC-INDUCTION METERS EMPLOYING THE HALL EFFECT.
11 Apr 61, 9p. incl. illus. (Trans. from Przeglad Elektrotechniczny 11:469-473, Nov 60).
(AID rept. 61-43) Unclassified report

DESCRIPTORS: Poland, *Fluxmeters, *Magnetic fields, Measurement, *Inductance, Magnetic effects, *Semiconductors, Design, Technological intelligence, Hall effect.

A measuring device, called a gaussmeter was developed for direct measurement of magnetic induction. It can be used more conveniently than conventional fluxmeters, since there is no need to move the sensor in and out of the magnetic field during measurements. Another of its advantages, in comparison with conventional fluxmeters, is the small size of the sensor with the halotron (4 x 2 x 0.2 mm), which permits accurate, almost point-to-point field measurements. These measurements can be applied not only to the values but also to the distribution of magnetic fields in narrow gaps of electromagnets or electric machines, as well as to dissipation fields. Gaussmeters of this type can be built for measuring magnetic induction in constant and variable magnetic fields with frequencies up to 10 to the 12th power cps. Gaussmeters used for measuring magnetic induction in constant fields are discussed. (Author)

AD-255 824 Div. 30, 2, 6
(12 May 61) OTS price $4.60

Air Force Cambridge Research Labs., Bedford, Mass.
AIDE ALTITUDE INTEGRATING DEVICE, ELECTRONIC, by Philip I. Hershberg, Jack R. Griffin, and Ruben H. Guenthner. Dec 60, 33p. incl. illus. tables. (Instrumentation for Geophysics and Astrophysics no. 16; AFCRL TR 60-437)
Unclassified report

DESCRIPTORS: *Meteorology, Computers, *Digital computers, *Electronic integrators, *Cloud height indicators, Digital systems, Coding, Design, Clouds.

The development of AIDE, and electronic calculating device that computes and displays cloud-height information for use by airfield weather observers, is described. Included is an explanation of the requirement for an electronic integrating device for cloud heights, a discussion of the general system design, and details of the design of each component unit. Also presented and discussed are logical equations used in the AIDE design, verifications of the Arithmetic Unit operation, and results of an evaluation testing program. (Author)

AD-255 831 Div. 30, 8
(12 May 61) OTS price $8.10.

General Atronics Corp., Bala-Cynwyd, Pa.
PANORAMIC SPECTRUM ANALYZER,
by Joseph T. Beardwood, III. Final rept. 14 Nov 60, 1v. incl. illus. (Rept. no. 818-189-6) (Contract AF 19(604)5218).
(AFCRL TR 60-369) Unclassified report

DESCRIPTORS: *Electronic circuits, *Speech, *Electronic equipment, Amplifiers, Design, Modulators, Oscillators, Switching circuits, Sound, Analysis, *Delay lines, Feedback, *Radiofrequency spectrum analyzers, Tuned circuits, Phase detectors,

A functional description, circuit descriptions, operation and alignment procedures, and complete schematic diagrams are presented for the Atronics Delay Line Spectrum Analyzer. The analyzer is in essence an electronically synthesized, time multiplexed filter bank. That is, the output of the instrument consists of voltage samples, arranged in frames, with corresponding samples in each frame being identical to the sampled outputs of single tuned filters driven by the wave being analyzed. (Author)

AD-255 890 Div. 30, 25
(16 May 61) OTS price $2.60

Frankford Arsenal, Philadelphia, Pa.
INVESTIGATION OF HALL EFFECT DEVICES FOR FLAW DETECTION IN FERROUS MATERIALS,
by Julian Rossnick. Technical rept. Feb 61, 22p. incl. illus. (Rept. no. R-1581)
Unclassified report

DESCRIPTORS: *Non-destructive testing, Test equipment, Hall effect, Semiconductors, *Magnetometers, *Ferromagnetic materials, Fracture (Mechanics), Surface properties, Detection, Magnetic fields.

An investigation of the state of the art in the development of Hall generators as applied to non-destructive testing has shown that the field of activity in both basic and applied work is limited but increasing very rapidly. Two magnetometer instruments are commercially available which can be used for the detection of magnetic leakage fields caused by cracked ferromagnetic materials. The limitations of various methods in crack detection are discussed with emphasis on the need for an effective flaw depth measurement technique. Experimental procedures and test results are described for various modes of operation such as dc, ac, and pulse power control current with a discussion of sensitivity, resolution and stability factors. (Author)

AD-255 896 Div. 30, 2, 22
(16 May 61) OTS price $1.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
THEORETICAL CONSIDERATIONS IN THE DESIGN OF AT-

MOSPHERIC TEMPERATURE-SENSING ELEMENTS,
by William C. Barr. Apr 61, 15p. incl. table.
(ASRDL Technical rept. no. 2195)
Unclassified report

DESCRIPTORS: Theory, *Atmosphere, Temperature, Measurement, Aluminum coatings, *Thermistors, Sounding rockets, *Upper atmosphere, Errors, Aerodynamic heating, *Temperature sensitive elements, Mathematical analysis, Heat transfer, Thermal radiation.

The basic equation for the behavior of an atmospheric temperature-sensing element is formulated and solved. The theory is then applied specifically to an aluminum-coated bead thermistor 0.01 inch in diameter, which is being used with a rocket sounding system to measure temperature in the upper atmosphere. The steady-state errors due to radiation and aerodynamic heating and the time constant are given for this element in the altitude region of 30 to 58.1 kilometers. (Author)

AD-255 921 Div. 30, 8
(15 May 61) OTS price $3.60

Aerojet-General Corp., Azusa, Calif.
BUILDING BLOCK STUDY,
by P. O. Burk and W. S. Simpson. Quarterly progress rept. no. 1, 17 Oct 60-15 Jan 61. 13 Feb 61, 1v. incl. illus. tables, 19 refs.
(Rept. no. 0447-01-1)
(Contract DA 36-039-sc-85159)
Unclassified report

DESCRIPTORS: *Electronic equipment, Design, *Test facilities, Test equipment, Maintenance, Maintenance equipment, Automation, Supply depots.

This study is concerned with the formulation of basic concepts and a detailed plan for the design of an integrated system of modular test equipment to meet the electronic maintenance need of the Signal Corps. Work accomplished includes a partial survey of equipment maintenance procedures and equipment, the preliminary determination of frequency testing requirements, and an operational research assessment of factors affecting the design of modular test equipment. (Author)

AD-255 978 Div. 30, 5
(15 May 61) OTS price $8.60

University Coll., London (Gt. Brit.).
AUTOMATIC SPEECH RECOGNITION: EXPERIMENTS WITH A RECOGNISER USING LINGUISTIC STATISTICS,
by P. Denes. Sep 60, 93p. incl. illus. tables
(Technical note no. 4)
(Contract AF 61(514)1176)
(AFCRL-165) Unclassified report

DESCRIPTORS: *Speech representation, Theory, Voice communication systems, Analysis, Computers, Typewriters, Test equipment, Instrumentation, Automatic, Intelligibility, *Speech.

The problem of transmitting speech over communication channels with smaller information-carrying capacity than that of conventional telephone links is discussed. Bandwidth compression systems using articulatory constraints (vocoders) are described and this is followed by a description of devices that analyse the speech sound wave in terms of linguistic units - machines performing this task are called automatic speech recognisers. Bandwidth economy can be achieved by recognising and transmitting these linguistic units. The difficulties of automatic recognition are discussed and its processes compared with the human mechanism for speech recognition. It is suggested that, just as in human speech recognition, the performance of an automatic recogniser could be improved by using information about the statistics and the structure of the language as well as the usual acoustic cues. The design and construction of a phoneme recogniser for putting this idea to the test is described. The machine has three parts: (1) the acoustic recogniser for detecting some simple phonemic cues, (2) stored knowledge about the digram frequencies of these phonemes, and (3) a device for selecting the phoneme that is most likely to occur in the light of both acoustic information and of the relevant digram frequencies. The selection is indicated on a typewriter. (Author)

31. SHIPS AND MARINE EQUIPMENT

AD-255 074 Div. 31
(3 May 61) OTS price $2.60.

Hydronautics, Inc., Rockville, Md.
CONSIDERATIONS OF HYDROFOIL BOAT HANDLING AND MOTIONS QUALITIES,
by Phillip Eisenberg. 30 Oct 60, 1v. incl. illus. tables, 36 refs. (Technical rept. no. 001-4)
(Contract NOb(s)-78396)
Unclassified report

DESCRIPTORS: *Hydrofoil boats, Design, Handling, Human engineering, Motion, Maneuverability.

Contents:
Handling and motions qualities requirements in hydrofoil craft design
Breakout forces
Maximum forces that can be exerted by pilots
Human comfort limits
Suggested design limits for hydrofoil craft motions
Effect of motions on performance

AD-255 266 Div. 31
(4 May 61) OTS price $1.10

Army Armor Board, Fort Knox, Ky.
SERVICE TEST OF SILENCED, COMMERCIAL, 18-HP OUTBOARD MOTOR.
16 Mar 61, 5p.
(Proj. NR 2096)
Unclassified report

DESCRIPTORS: *Marine engines, Noise, Tests, Acoustic insulation.

AD-255 478 Div. 31
(8 May 61) OTS price $5.60.

Long Beach Naval Shipyard, Calif.
COLLECTION OF REPORTS OF VIBRATION SURVEYS.
1960, 1v. incl. illus. tables.
Unclassified report

DESCRIPTORS: *Naval vessels, *Vibration, Measurement, Sources, Ship hulls, Blowers, Generators, Marine engines, Turbines, Reduction gears, Fuel pumps, Compressors, Pumps, Motor generators, Sonar equipment, Bearings, Refrigerant compressors,

Thirty-one vibration survey reports for 22 Naval vessels are presented. Measurements were made of amplitude and frequency of vibration on various shipborne equipment, and recommendations for corrective action were made when vibration was considered excessive.

AD-255 728 Div. 31, 9, 14, 17
(11 May 61) OTS price $5.60

Material Lab., New York Naval Shipyard, Brooklyn.
CAVITATION EROSION AND BEHAVIOUR OF MATERIALS,
by J. Z. Lichtman, D. H. Kallas and others.
23 Jan 61, 1v. incl. illus. tables, 27 refs.
(Suppl. to AD-255 611L)(Lab. proj. 4759-14)
Unclassified report

DESCRIPTORS: *Cavitation, Erosion, *Metals, Materials, *Plastics, *Coatings, Test equipment, Hydrofoils, *Hydrofoil boats, Velocity, Hydrostatic pressure, Mechanical properties, Physical properties, Steel, Nickel alloys, Cobalt alloys, Nylon, Plastic coatings, Ceramic coatings, Brass, Glass, Motion picture photography, Hardness.

High speed cinematography and a rotating-disk apparatus were employed in comparative studies of materials and of the cavitation erosion phenomenon. The rotating-disk apparatus consists essentially of a test chamber in which a 12-in.-diam by about 1/8 in.-thick specimen disk may be rotated in water under controlled conditions of fluid pressure and disk rotational speed. An increase in erosion rate with increase in velocity was typical of all the materials tested; total erosion increased with exposure time. No direct relationship could be established between erosion resistance and hardness or mechanical properties of metals. However, a hard high-strength material such as Stellite 6B was very resistant, while a soft low-strength material such as Al 1100-0 had low resistance. The ultimate elongation of the plastics appeared to be significant in determining their erosion resistance. Fused glass and fused high-hardness flame-sprayed Ni-Cr alloy coatings had high erosion resistance. The resistance of elastomeric coatings with high tensile strength was even greater than that of very hard metallic and ceramic materials.

AD-255 985 Div. 31, 1
(16 May 61) OTS price $3.60

Douglas Aircraft Co., Inc., El Segundo, Calif.
ARRESTING ENGINE WIRE ROPE TESTS,
by W. O. Harrison. Jan 61, 37p. incl. illus. tables. (Rept. no. ES 40207)
(Contract NOa(s) 59-6009c)
Unclassified report

DESCRIPTORS: *Arresting gear, Airplane landings, Carrier landings, Tests, Launching, Airplanes, Naval aircraft, *Cable assemblies, Life expectancy, Jet planes, Test methods.

The results are presented of abrasion tests conducted on various constructions of arresting engine wire rope. The wire ropes were comparatively tested to determine which construction is the best for further investigation, i.e. tests conducted on an actual arresting gear using a dummy weight and/or the wire ropes being evaluated aboard a carrier during actual arrestments. The results of the tests indicate that the present wire rope has the lowest service life of any of the 6 x 25 or 6 x 30 flattened strand construction furnished for evaluation. It was determined that the life of the wire rope is increased by using a wire rope core instead of a fibre core and that using a lang lay rope is superior to a regular lay rope. The wire rope showing the maximum life under the higher load conditions was a 6 x 30, flattened strand, lang lay, and wire rope core. (Author)

32. MISCELLANEOUS ARTS AND SCIENCES

AD-255 189 Div. 32, 15
(2 May 61) OTS price $3.60

Princeton U., N. J.
EXPENDITURE CONFIGURATIONS,
by S. N. Afriat. 7 Feb 61, 25p. (Research memo. no. 21)
(Contract Nonr-185816)
Unclassified report

DESCRIPTORS: *Costs, *Economics, *Commerce, *Mathematical analysis, Procurement, Theory, Configuration.

Contents:
Market equation
Purchases
Expenditure balance
Expenditure configurations
Cross-expenditures
Cross-structure
Preferences
Consistency
Preference hypothesis
Normality
Levels and multipliers
Coherence and concordance
Concordance and consistency
Consistent and concordant scales

AD-255 291 Div. 32
(7 May 61) OTS price $2.60

Naval Ordnance Lab., White Oak, Md.
PIONEERING IN MACHINE LITERATURE SEARCHING AND

RETRIEVAL.
Apr 61. 22p. incl. tables.
(NAVWEPS rept. no. 7388) Unclassified report

Presented at the Sixth meeting of the Council of Librarians, East Coast Navy Labs., held at the Naval Ordnance Lab., White Oak, Md., on 5 Oct 60.

DESCRIPTORS: *Documentation, Data processing systems, Digital computers, Library science, Libraries, *Symposia.

These papers cover the programs of the American Society for Metals and the Naval Ordnance Laboratory in developing information retrieval programs. The first paper evaluates the experience at ASM in machine searching versus conventional library reference searching and finds machine searching to be more effective. The mathematicians explain the direct and indirect file for organizing library material for machine searches. Also discussed is the computer program adopted for the NOL Library. In the final paper, the Library's use of the computer and some of the advantages are set forth. (Author)

AD-255 416 Div. 32
(4 May 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
GENERAL BIBLIOGRAPHY - TEXTBOOK FOR LIBRARY INSTITUTES.
Dec 60, 34p. (Trans. no. F-TS-9909/III from Obshchaya Bibliografiya - Uchebnik Dlya Bibliotechnykh Institutov:183-209, 1957)
Unclassified report

DESCRIPTORS: USSR, *Bibliography, *Library science.

AD-255 784 Div. 32
(10 May 61) OTS price $6.60

Library Services Section, Air Information Div. Washington, D. C.
LIST OF COMMUNIST CHINESE SCIENTIFIC AND TECHNICAL PERIODICALS. Annotated bibliography.
24 Feb 61, 63p. 247 refs. (AID rept. 61-21)
Unclassified report

DESCRIPTORS: *Bibliography, Scientific reports, *Periodicals.

An annotated bibliography of 247 titles is presented which reflects Communist China's periodical publishing activity in the subject fields of science and technology, with the exception of life sciences. The titles are arranged in alphabetical order according to the Wade-Giles romanization system and are followed by the Chinese characters and the translated titles. Some entries also carry the Communist P'in-yin or the Latin titles when these are available on the original publications. The annotation gives the frequency, place of publication, and publishing body of the journal, and a sketch of its characteristics with a brief analysis of its contents. Notes are added to indicate title changes and other pertinent data. The holdings of the Air Information Division are given. A subject index to the periodical titles is provided at the end of this bibliography. (Author)

33. TRANSPORTATION

AD-255 361 Div. 33
(4 May 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CIVIL AVIATION (SELECTED ARTICLES)
Nov 60, 19p. (Trans. no. MCL-108 from Grazhdanskaya Aviatsiya, pp 1, 27-28, 33-35, Feb 59)
Unclassified report

DESCRIPTORS: *Civil aviation, Aircraft, Aircraft equipment, USSR.

AD-255 724 Div. 33
(10 May 61) OTS price $4.60.

St. Anthony Falls Hydraulic Labs., U. of Minn., Minneapolis.
AN EXPLORATORY INVESTIGATION OF MOBILE BREAKWATERS,
by Lorenz G. Straub, H. D. Frederiksen, and J. M. Wetzel. June 59, 41p. incl. illus. 13 refs.
(Project rept. no. 60)
(Contract NBy-3143)
Unclassified report

DESCRIPTORS: *Breakwaters, Ocean waves, Attenuation, Design, Floating bodies, Model tests, Water tunnels, Harbors,

The devices investigated consisted of floating-plate absorbers, floating membranes, viscous blankets, and pneumatic wave mattresses. Results of tests on floating plate absorbers and membranes are not encouraging whereas the viscous blanket and pneumatic wave mattress seem promising. The viscous blanket gave satisfactory attenuation wave lengths up to about twice the blanket length. The performance of the pneumatic wave mattress was slightly below that of the viscous blanket in this range, but exceeded the viscous blanket for wave lengths greater than twice the absorber length. Both units operated satisfactorily for a considerable range of wave lengths. (Author)

NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

ASTRONOMY

PB 154 033 $1.60

Duntley, S. Q., La Jolla, Calif.
DAYTIME VISIBILITY OF STARS BY THE HIGH ALTITUDE OBSERVER. PART I. THE CASE OF UNAIDED VISION, by John H. Taylor. Rept. no. 5-8 on Contract NObs-72039. June 60, 19p. 5 refs; AD-251 742.

DESCRIPTORS: *Celestial navigation, Stars, *Visibility, High altitude flight *Sky brightness.

The daytime visibility of stars by an observer at high altitude has been estimated by means of a laboratory experiment in which the luminance and color of the zenith sky at 50,000 feet were simulated and an artificial star of color temperature 5500°K. presented in a known location. The sky background was varied in size in order to imitate the presence of a sunshade or the field of an instrument of restricted acceptance angle. The sky luminances used corresponded to solar elevations of approximately 1.5° and 11°. Even under optimum conditions the required stellar magnitudes lie between 0 and -2. Field conditions of observation will impose additional requirements for intensity, owing to the transmission losses common to optical instruments and aircraft canopies. The data refer only to the zenith sky, and the increase in sky luminance as the horizon is approached will further disable the observer at zenith angles which depart more than a few degrees from zero. Celestial navigation by conventional means and with unaided vision is not feasible at high altitude during daylight. (Author)

PB 154 129 $2.60

Stanford Electronics Labs., Stanford U., Calif.
THE STANFORD MICROWAVE SPECTROHELIOGRAPH ANTENNA, A MICROSTERADIAN PENCIL-BEAM INTERFEROMETER, by R. N. Bracewell and G. Swarup. Scientific rept. no. 7 on Contract AF 18(603)53. 25 Nov 60, 30p. 29 refs. Stanford Radio Astronomy Inst. pub. no. 7; AFOSR TN-60-1240; AD-249 516.

DESCRIPTORS: *Interferometers, *Parabolic antennas, *Microwave equipment, *Antennas, *Radio astronomy, Instrumentation, Spectrographic analysis, Design, *Solar spectrum, *Microwave spectroscopy, *Solar disturbances, Antenna radiation patterns.

Open-ended Terms: Spectroheliograph antenna.

A pencil-beam interferometer was constructed with multiple beams of 3.1 minutes of arc width to half power (0.8 microsteradians). It is composed of 2 equatorially-mounted, 16-element, Christiansen arrays of 3-m paraboloids, each 375 ft long (1339 wavelengths at a wavelength of 9.1 cm). The half-power beamwidth of the fan beam of a single array is 2.3 minutes of arc. To form the pencil beam, the 2 arrays are switched together as in a Mills cross. Frequency range is from 2700 to 3350 mc. Phase adjustment and monitoring are handled by a new technique of modulated, weakly reflecting gas-discharges maintained at the focus of the paraboloids. Television-type scanning yields maps of the sun (spectroheliograms) revealing fine details of the microwave source regions in the chromosphere and corona. All the transient bursts and a large fraction of the steady solar emission at 9.1 cm prove to originate in a small number of highly compact centers. The sensitivity of the instrument also allows the thermal emission from the moon (250 K) and a number of galactic and extragalactic sources to be studied with high angular resolution. (Author)

Astrophysics

PB 171 803 $1.00

Air Force Cambridge Research Labs., Bedford, Mass.
AN INTRODUCTION TO THE MOON, by John W. Salisbury. July 60, 34p. 6 refs. [AFCRL] TN-60-456; AD-244 486.

DESCRIPTORS: *Moon, Geodetic astronomy, Geography, Geophysics, Extraterrestrial geography.

In response to many inquiries from schools and civic groups all over the country, the Geophysics Research Directorate of the Air Force Research Division has produced this booklet on the moon. In it our present knowledge and theories concerning the origin of the moon and lunar surface structures is summarized in layman's language for use primarily by schools and teachers.

PB 154 401 $2.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
A THEORY OF RADAR REFLECTIONS FROM THE MOON, by Fred B. Daniels. Nov 60, 21p. 11 refs. USASRDL Technical rept. 2163; AD-247 077.

DESCRIPTORS: *Moon, *Radar reflections, Radar echo areas, Surface properties, Extraterrestrial geography, Radar signals, Measurement, Theory.

A theory of radar reflections from a curved surface with random irregularities is developed and the theory is applied to the moon. It is found that certain lunar surface parameters that are characteristic of the small-scale structure can be determined from fading measurements of radar echoes. These same parameters can be used to compute the angular power spectrum of the surface and, since the latter can be independently measured, an additional check on the theory can be obtained. Qualitatively, the agreement is found to be good for measurements made at 413 mc. The rms value of the slopes of the small-scale features can also be deduced and it appears that some of these slopes are so steep that they give rise to radar reflections from regions near the limb. A general picture of the lunar surface deducted from radar data is that of a surface pock-marked by telescopically invisible meteor pits having a wide range of sizes down to a limit that was not determined. (Author)

PB 154 451 $9.10

Center for Radiophysics and Space Research, Cornell U., Ithaca, N. Y.
RANGE, DECLINATION, AND DOPPLER-SHIFT CALCULATIONS FOR AN INTERPLANETARY RADAR, by L. M. LaLonde. Scientific rept. no. 6 on Contract AF 19(604)6158. 30 June 60, 105p. 2 refs. Research rept. RS 10; ARPA Order no. 106-60; AFCRL-TN-60-1161; AD-250 477.

DESCRIPTORS: *Doppler radar, *Planets, *Radio astronomy, Radar equipment, *Radar echo areas, *Radar reflections, Determination, Signal to noise ratio, Mathematical analysis, Measurement.

Efforts will be made to receive a radar echo from planets using the facilities of the Arecibo Radio Observatory. Calculations show that Venus, Mars, Mercury and Jupiter are likely radar targets for this facility. The planets have a predetermined motion with respect to the radar on the earth's surface, and to tune a narrow-band receiver to the frequency of the reflected echo, Doppler shifts must be predicted. An approximate equation for the relative velocity of a planet is given. Plots of relative velocity, and Doppler shift are given, as well as plots of range and declination for the likely targets (planets) for the years 1960-1967. (Author)

PB 154 089 $10.50

Laboratory of Astrophysics and Physical Meteorology, Johns Hopkins U., Baltimore, Md.
OBSERVATIONS OF THE INFRARED EMISSION OF PLANETS AND DETERMINATION OF THEIR TEMPERATURES, by William M. Sinton and John Strong. Progress rept. on Contract Nonr-248(01). 15 Apr 60, 136p. 28 refs. AD-250 440.

DESCRIPTORS: *Infrared radiation, *Planets, Temperature, Determination, Measurement, *Infrared spectroscopy, Venus, Mars.

Modern infrared techniques were applied to the measurement of the spectrum of thermal radiation received from the planets, and determination of their temperatures. Observations were made in the transparent region 8 - 13 microns. Corrections of the observations for the lack of full transmission of the earth's atmosphere were determined by extrapolation of observed planetary emission to outside of the atmosphere, using the square-root law. The radiometric observations were made with the 200-inch telescope. On reduction, these observations yielded temperatures at the center of the disks of Venus and of Mars of -39°C and 15°C, respectively. Spectra of Venus and Mars in the 8 - 13 micron spectral region were obtained with both prism and grating spectrometers. (Author)

PB 154 375 $4.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE SCATTERING PROPERTIES OF THE LUNAR SURFACE AT RADIO WAVELENGTHS, by J. V. Evans Rept. on Contract AF 19(604)7400. 10 Jan 61, 44p. 39 refs. 3G-0004; AD-250 684.

DESCRIPTORS: *Moon, Surface properties, Scattering, *Radio waves, Reflection, Surfaces, *Radar echo areas, Radar equipment, Radio astronomy, Polarization, Model tests, Statistical functions.

This paper presents a review of the best experimental results that are at present available concerning the radio reflection properties of the moon. Observations by many workers to determine the radio albedo of the moon are compared and shown to yield a value of the order of 0.08. The corresponding value for the dielectric constant of the surface materials is 2.7. This is similar to that observed for dry terrestrial sand, and suggests that the surface is porous in texture. The distribution and the character of the scattering centres on the lunar surface have been determined both by measurements of the echo amplitude auto-correlation function, and measurements of echo power as a function of distance measured from the leading edge of the moon. These two techniques are shown to yield comparable results, when the assumption is made that the signals are reflected from many incoherent scatterers The published work of four authors who have attempted a statistical description of the lunar surface which would account for the radar observations is examined. The results reviewed here show that a Gaussian distribution of the lunar surface slopes is not a good description of the surface. (Author)

SCR-252 $0.50

Sandia Corp., Albuquerque, N. Mex.
SOLID INTERPLANETARY MATTER, by David Beard. Research Colloquium, Jan 61, 21p.

PB 154 130 $2.60

Stanford Electronics Labs., Stanford U., Calif.
STANFORD MICROWAVE SPECTROHELIOGRAMS FOR 1960 APRIL, by G. Swarup. Scientific rept. no. 8 on Contract AF 18(603)53. 15 Dec 60, 27p. 2 refs. Stanford Radio Astronomy Inst. pub. no. 8; AFOSR TN-60-1491; AD-249 517.

DESCRIPTORS: *Sun, Solar atmosphere, *Solar energy, Radiofrequency, Superhigh frequency, Mapping, *Radio waves, Spectrographic analysis.

Maps of the sun are given showing the disc distribution of solar radio emission at a wavelength of 9.1 cm by means of radioisophotes, or lines of constant brightness temperature. The contour interval, which varies from map to map, is usually about 80,000 deg K, and is determined after the map is drawn by reference to the measure flux density of the whole sun. A circle shows the photosphere; a correction was applied for the variation of the sun's semi-diameter, so that the photospheric circle is reproduced with a constant diameter of 15 cm. This scale, and the orientation (north end of rotation axis at top, east on left) are in accordance with the convention adopted at the tenth general assembly of the International Astronomical Union in 1958, for the purpose of facilitating comparisons of solar data. (Author)

PB 154 039 $1.10

Visibility Lab., U. of California, San Diego.
MAPS OF SKY LUMINANCE AT VARIOUS ALTITUDES, by S. Q. Duntley, A. R. Boileau and others. Rept. on Contract NObs-72092. Feb 60, 9p. STO Ref. 60-12; AD-240 679.

DESCRIPTORS: *Sky brightness, Sky, *Luminescence, Atmosphere, High altitude, Maps, Optics, Optical instruments, Airborne, Aircraft.

Open-ended Terms: B-29.

The Visibility Laboratory has instrumented a B-29 aircraft for documentation of the optical properties of the atmosphere within the visible spectrum. Two of the instruments are hemispherical scanners, one for the upper hemisphere and one for the lower hemisphere. These scanners measure the luminance of the upper and lower hemispheres. They have 5° resolution and require approximately 1 1/2 minutes for a complete scan. The instruments are photopically corrected and the data is reported in the photometric units of foot-lamberts. (Author)

BEHAVIORAL SCIENCES

PB 171 299 $0.75

Laboratory of Aviation Psychology, Ohio State U. Research Foundation, Columbus.
THE INFLUENCE OF OVERLAY CONFIGURATION ON THE ESTIMATION OF HEADING AND SPEED, by Stanley M. Moss, Conrad L. Kraft, and William C. Howell. Rept. on Contract AF 33(616)6166, continuation of Contracts AF 33(616)43 and AF 33(616)3612. Mar 61, 24p. 8 refs. WADD Technical rept. 61-141.

DESCRIPTORS: *Plan position indicators, *Target position indicators, Radar equipment, Display systems, *Targets, Velocity, Range.

Two experiments were undertaken to determine the influence of PPI overlay configurations on judgments of target heading and speed. In both studies the overlay conditions were: clear display, range rings, angle marks, and range rings with angle marks. Additional variables in Experiment I (heading judgment) were target speed (two lengths of lead or trail) and method of displaying speed (lead vs. trail coding). In Experiment II (speed judgment), additional variables included speed range and separation of standard and comparison stimuli. Twenty subjects served in Experiment I and nine in Experiment II. All configurations were presented in random sequence using a filmstrip projector; rate of presentation was controlled by the subject. Response time and errors were recorded. Heading estimation improved and speed estimation suffered when angle marks were present. Range rings had little effect on either judgment. Trail coding led to more accurate, although less rapid, heading judgments than lead coding. (Author)

Personnel and Training

PB 171 782 $1.75

Aerospace Medical Div., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
USES OF TASK ANALYSIS IN DERIVING TRAINING AND TRAINING EQUIPMENT REQUIREMENTS. Dec 60, 67p. 10 refs. WADD Technical rept. 60-593.

DESCRIPTORS: *Training devices, *Military training, Psychology, *Training, *Job analysis, Human engineering.

The requirements for and uses of task information in developing requirements for training equipment are discussed in a series of seven papers by the human factors subcontractors involved in the development of three complex electronic reconnaissance systems. The papers deal with the purposes, content, sources, and recording of task information. They cover the uses of task analysis information in establishing training requirements, selecting training equipment, and developing proficiency measures. A final paper describes in detail the approach taken on these issues with the AN/ULD-1 system. (Author)

PB 154 357 $1.60

Air Force Command and Control Development Div., Bedford, Mass.
USE OF A TEACHING MACHINE FOR AIR FORCE ON-THE-JOB TRAINING IN THE SAGE SYSTEM, by Sylvia R. Mayer. Sep 60, 20p. 6 refs. AFCCDD-TN-60-51; AD-250 277.

DESCRIPTORS: *Military training, Air Force, *Training devices, Programming, Design, Learning, Psychology.

Open-ended Terms: Sage.

A teaching machine was used for military on-the-job training in SAGE operations over a 16-month period. This was a follow-up of a brief feasibility study. The purpose was (1) to see if the initial enthusiasm for auto-instruction would continue and increase as the novelty effect waned, and (2) to uncover unanticipated implementation problems. Operators sustained and increased their use of the teaching machine during the observation period. The training staff continued to favor use of the device. Patterns of usage related to program familiarity and crew proficiency are described. Problems in application of auto-instruction are noted. Some may be unique to military on-the-job training for complex electronic systems such as SAGE. These problems relate to (1) programing capability, (2) types of training tasks, (3) teaching machine design, and (4) program design. Some research requirements are indicated. (Author)

PB 171 290 $2.00

Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF VARIOUS LEVELS OF AUTOMATION ON HUMAN OPERATORS' PERFORMANCE IN MAN-MACHINE SYSTEMS, by Ralph E. Thomas, Walter J. Huebner (Behavioral Sciences Lab.) and others. Rept. for 1 Apr 59-31 Mar 60 on Psychological Research on Human Performance, Contract AF 33(616)6395. Feb 61, 157p. WADD Technical rept. 60-618.

DESCRIPTORS: *Automation, Human engineering, Analog computers, Psychology, *Job analysis, Control systems.

This report describes a method for generating definitive data on the effects of various levels of automation on human operators' performance in man-machine systems. The method incorporates a model and equipment for theoretical and experimental investigations. Equipment was designed and built in accordance with the assumptions of the automation model for studying human performance in an automation environment. Functions to be controlled are generated by a general-purpose analog computer. Pilot experiments have demonstrated that the equipment is suitable and that the model adequately describes automation problems. Significant effects of various levels of automation were demonstrated in some of the experiments. (Author)

PB 171 777 $0.75

Behavioral Sciences Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
TEACHING MACHINES IN THE MODERN MILITARY ORGANIZATION, by Gordon A. Eckstrand, Marty R. Rockway and others. Rept. on Human Factors in the Design of Training. Dec 60, 30p. 17 refs. WADD Technical note 60-289.

DESCRIPTORS: *Military training, *Training devices, Automation, Human engineering, Learning, Psychology, Military personnel, Machines.

The concept of "teaching machines" is explained and its relation to military training problems is made clear. Descriptions are given of the machines and techniques of Pressey, Skinner, Crowder, and Pask. Some emerging theoretical issues are briefly presented and discussed. Research intended to develop the potentialities of the "teaching machine" concept is described by reference to the current research program of the Behavioral Sciences Laboratory. The military uses of teaching machines and of the efforts needed to make their widespread use a reality are discussed. (Author)

PB 171 292 $0.50

Laboratory of Aviation Psychology, Ohio State U. Research Foundation, Columbus.
SOME SOURCES OF LOAD AND CONSTRAINTS ON OPERATOR PERFORMANCE IN A SIMULATED RADAR AIR TRAFFIC CONTROL TASK, by J. S. Kidd. Rept. on Contract AF 33(616)6166, continuation of Contracts AF 33(616)43 and AF 33(616)3612. Mar 61, 20p. 12 refs. WADD Technical rept. 60-612.

DESCRIPTORS: *Air traffic control systems, Simulation, *Radar operators, Tests, Human engineering, Psychology, Automation, Job analysis, Aviation personnel.

Two general factors relevant to human performance in a man-machine system were subjected to experimental analysis: (a) the influence of task load on operator capacity and (b) the effects of situational constraints on operator adaptability. Four variables, traffic input rate, control zone area, control team organization, and

arrival sequencing procedures, were manipulated. Results from the observation of six 2-man teams indicated that physically defined constraints were more detrimental than those imposed by rules or organization structure. Procedures intended to enhance performance which depend on operator predictions or anticipations were observed to have a limited utility. Under high load stress, operator's actions seemed entirely determined by the immediate circumstances. (Author)

SCTM 53-61(14) $0.75

Sandia Corp., Albuquerque, N. Mex.
INSPECTOR ACCURACY: A STUDY OF THE LITERATURE, by R. L. McCornack. Feb 61, 30p.

PB 154 053 $1.60

Visibility Lab., U. of California, San Diego.
AN ADAPTATION OF THE METHOD OF PROBIT ANALYSIS TO PSYCHOPHYSICAL THRESHOLD DATA, by William Hadley Richardson. Rept. on Contract NObs-72092. June 60, 19p. 5 refs. SIO Ref. 60-47; AD-251 826.

DESCRIPTORS: *Visual thresholds, *Visual perception, *Factor analysis, *Targets, Visibility, *Target recognition.

The objective of this development is to adapt the methods of probit analysis to automatic desk calculator computation by personnel relatively untrained and unoriented in probability techniques and in methods of psychophysical determination of visual thresholds.

Psychology

PB 171 293 $0.50

Antioch Coll., Yellow Springs, Ohio.
JUDGMENTS OF THE RELATIVE FREQUENCY OF TWO RANDOM SEQUENTIAL EVENTS: EFFECTS OF RATE OF PRESENTATION, by James Palmore, Jr. and Dwight E. Erlick (Behavioral Sciences Lab., Wright Air Development Div.). Rept. on Contract AF 33(616)6095. Mar 61, 12p. 3 refs. WADD Technical rept. 60-714.

DESCRIPTORS: *Factor analysis, *Reasoning

The effect of presentation rate on a man's ability to determine which of two mutually exclusive random sequential events has occurred more frequently was investigated using rates of one, two, four and eight events per second. Two specific studies were carried out using the same relative differential frequencies between the events but varying the absolute number of events in the total series. The results indicate that the accuracy of perceiving the more frequent event decreases as the presentation rate of the events increases. The effect of rate also acted differently for a short and long series of events; as presentation rate increased, a short series of events showed a significantly steeper decline in accuracy than a long series of events. (Author)

PB 155 860 $2.60

Aviation Psychology Lab., U. of Illinois, Urbana.
THEORIES OF VIGILANCE, by Judith P. Frankmann and Jack A. Adams. Technical note on Contract AF 19(604)5705. 30 Apr 60, 27p. 52 refs. AFCCDD-TN-60-25; AD-245 063.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Attention, Behavior, Monitors, Inhibition, Sensory perception, Nervous system, Stimulation, Display systems, *Conditional reflex, Physiology, Intensity.

A review was made of contemporary theories of monitoring behavior which attempt to account for the empirical findings on variables influencing the attentiveness of the human operator under conditions of prolonged monitoring. The four principal theories reviewed are: inhibition, attention, expectancy, and sensory variation. The most serious problem at this time is a lack of theoretical specificity. The inhibition and attention hypotheses are the least useful of the four theories. Expectancy, as an organismic state determining the response level of operator, is being given increased research attention and refinement. The sensory variation hypothesis, which proposes a requirement of the central nervous system for variety of impinging stimuli, is the most successful of the four theoretical positions in accounting for our present-day findings. However, its success may partly be a function of its generality, with a consequent inability of the theory to produce precise deductions whose lack of empirical verification would constitute negative evidence for the theoretical view. The sensory variation hypothesis has received the least direct attention of all the theories of vigilance, but the potential scope of its explanatory power could be large. Increased formalization of this hypothesis could be fruitful, particularly in integrating the different behavioral trends found for simple and complex monitoring tasks. (Author)

PB 154 108 $1.60

Cognitive Operations Lab., Bethany Coll. [W. Va.]
REPETITION OF TWO EXPERIMENTS ON MILD STRESS AND PROBLEM SOLVING, by Wilbert S. Ray. Technical rept. no. 4 on Contract Nonr-2315(00). Apr 60, 13p. 11 refs. AD-235 021.

DESCRIPTORS: *Stress (Psychology), Errors, Inhibition, Psychomotor tests, *Reasoning.

In the first of 2 experiments it was found that asking subjects to hurry interfered with their solving of the disc-transfer problem. This experiment was repeated because on a first occasion it was not done with standard conditions by trained test-administrators. The repetition produced the same conclusions as did the first trial of the hypothesis. The second experiment was a repetition of one in which the subject was less able to find the source of his own error than to find the

source of another man's error. The original findings were not supported. This is not taken to mean that the personal-impersonal variable will not interfere with problem solving, but is attributed to some difficulty in the replication. (Author)

PB 154 110 $8.60

Vanderbilt U. [Nashville, Tenn.]
STUDIES IN ABSTRACTION LEARNING: IV. THE TRANSFER EFFECTS OF CONCEPTUAL VS. ROTE INSTRUCTION IN A SIMULATED CLASSROOM SITUATION, by Leland E. Thune and Stanford C. Ericksen. Technical rept. no. 6 on Contract [Nonr]2149(01). Apr 60, 98p. 7 refs. AD-236 068.

DESCRIPTORS: *Learning, *Transfer of training, Theory, *Sensory perception, Tests, Memory, Psychology, Reasoning, Training, Education, Perception.

Two groups of subjects which differed in the method of instruction employed in learning to operate an automatic electric calculator were compared. The Rote group received direct practice in the operation of a Friden calculator. The Concept group received a type of instructional exercise which abstracted the controlling cues from a particular machine and presented them to the subject in a more generalized and symbolic form which, it was hypothesized, could be transferred efficiently from one machine to another. Two control groups were employed to provide baseline data for evaluating the effectiveness of the several types of training on the acquisition, retention, and transfer of skill in calculator operation. The most important finding was the high retention and transfer of abstraction learning (Concept group) as compared with perceptual learning (Rote group). On the theoretical level, this is interpreted as confirming the principle that performance based upon response to symbolically mediated cues shows greater flexibility in utilization (transfer) than does performance based upon response to presently given external stimuli. It was shown that a training exercise making use of only paper-and-pencil materials (Concept group) can provide a type of training which results in equal retention and superior transfer to that produced by a training exercise involving direct practice in the operation of the task machine (Rote group); retention and transfer in each case being measured in terms of actual proficiency in machine operation. (Author) (See also PB 147 707)

PB 154 015 $3.60

Visibility Lab., U. of California, San Diego.
PATTERN TARGET ANALYSIS. PART I. A THEORY. PART II. A PSYCHOPHYSICAL EXPERIMENT, by Ailene Morris. Rept. on Contract NObs-72092. Nov 59, 32p. 6 refs. SIO Ref. 59-62; AD-231 629.

DESCRIPTORS: *Targets, Visibility, *Target recognition, Illumination, *Visual perception, *Visual thresholds, Configuration.

A theory of pattern target analysis was evolved which proposes that: (1) patterned visual targets have elements or zones that are visually separable in terms of their area and contrast; (2) the visibility of specific targets depends upon their inherent physical characteristics plus the luminance conditions under which they are observed; (3) the discernible elements in the patterned target may be considered as several independent targets simultaneously viewed, each with its detection is that target element which can be seen at greatest range because of its particular size and contrast with the background; (5) recognition of a patterned visual stimulus is the discrimination of sufficient details of the target to provide a basis for classifying it; (6) if, for some targets, a critical element for recognition may be defined, then from the physical characteristics of this element, the visibility range for recognition may be predicted. A target may be defined as patterned if it has distinguishable areas of size and reflectance so that it cannot be made to match a uniform background through adjustment of the illumination upon it. A psychophysical experiment was conducted to determine the visual detection threshold for targets of various shapes and internal pattern configurations as observed under various luminance conditions and, from descriptions of the appearance of these targets, to define the effective visual stimulus. (Author)

PB 154 045 $1.60

Visibility Lab., U. of California, San Diego.
VISUAL CONTRAST THRESHOLDS FOR LARGE TARGETS. PART I. THE CASE OF LOW ADAPTING LUMINANCES, by John H. Taylor. Rept. on Contract NObs-72092. June 60, 15p. 7 refs. SIO Ref. 60-25; AD-245 104.

DESCRIPTORS: *Visual thresholds, *Sensitivity, Visibility, Target recognition, Detection, Targets, Illumination, *Dark adaptation.

Data for two scotopic adaptation luminance levels are presented. In addition to the threshold values, C_T, are the following: (1) O_T - the standard error of the threshold; (2) b - the slope of the psychophysical function; (3) O_b - the standard error of the slope; (4) X^2 - the value of Chi-square; and (5) $p(X^2)$ - the Chi-square probability for 3 degrees of freedom. The data were used to extend the curves relating target size to contrast threshold for adaptation luminances of 10^{-4} and 10^{-5} foot-lamberts. At these scotopic levels the data for the 6° circular target are in very close agreement with the values reported by Blackwell (identical at 10^{-4} and three per cent lower at 10^{-5} ft-L), despite the considerably shorter target durations used. (Author)

BIOLOGICAL SCIENCES

PB 154 093 $1.60

American Geographical Society, New York.
PRELIMINARY LIST OF PLANTS COLLECTED FOR THE EXPEDITION TO LAGUNA DE SAN RAFAEL, PROVINCE OF AISEN, 1959, by Carlos Munoz Pizarro. Technical rept. on Contract Nonr-641(04). Apr 60, 18p. AD-235 326.

DESCRIPTORS: *Plants, *Chile, Geography, Indexes, Classification.

The expedition was carried out in order to reconstruct the late-Pleistocene (late-glacial and postglacial) environments of southern Chile. The fundamental objective of this research is to uncover facts which will lead to an understanding of inter-hemispheric climatic relationships and the underlying mechanisms causing climatic changes.

PB 171 288 $0.75

Biomedical Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
PREPARATION OF CEREBRAL TISSUE BY THE FROZEN SECTION METHOD, by Marion T. Johnson. Rept. on Acoustic Energy Control. Oct 60, 23p. 10 refs. WADD Technical rept. 60-589.

DESCRIPTORS: *Tissue (Biology), Freezing, *Brain, *Histological sections, Preparation.

A rapid method of fixation was used on brain tissue prior to sectioning on the freezing microtome. Five selective stains demonstrated tissue reaction to various minute metal rods implanted in the cerebrums of 16 cats. The rods were removed at different intervals. The astrocytic reaction shown by Cajal's stain was the most sensitive index of tissue change.(Author)

Anatomy and Physiology

PB 153 943 $2.60

Aerospace Medical [Div.] Wright Air Development [Div.] Wright-Patterson Air Force Base, Ohio.
APPLICATION OF SKIN RESISTANCE IN PSYCHOPHYSIOLOGICAL STUDIES, by Gilbert E. Johnson, Jose Serrano, Jr. and Edwin Z. Levy. Rept. on Biophysics of Flight. Dec 59, 22p. 8 refs. WADC Technical rept. 59-688; AD-243 613.

This report released for sale to the public 1 June 61.

DESCRIPTORS: Skin, *Galvanic skin response, Measurement, *Attention, Fatigue (Physiology), Acceleration, Test equipment, Drugs, Flight, *Electrodes, Sensitivity, Resistance, Temperature.

The usefulness of measuring changes in skin resistance as a device to detect the impairment of consciousness in personnel whose work requires maximum alertness was investigated during isolation, in flight, under acceleration, under the influence of drugs, and other conditions. These experiments have determined that the use of skin resistance for monitoring of consciousness is promising; however, further studies are necessary before this method may be used as an operational tool. The effects of temperature and environmental changes must be eliminated, and the patterns of skin resistance must have better quantification. (Author)

PB 171 784 $0.50

Biomedical Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
A HEAT PULSE OVEN FOR STUDY OF HUMAN THERMAL TOLERANCE, by J. F. Crocker and Charles R. Waitz. Rept. for July 58-July 59 on Physiology of Flight. Dec 60, 12p. 4 refs. WADD Technical rept. 60-733.

DESCRIPTORS: *Heat tolerance, Determination, Space flight, Simulation, Physiology, Psychology, Heat production (Biology), *Thermal stresses

A 4 foot cubic chamber with thin aluminum walls has been built to simulate the thermal surroundings of the crew of a hypersonic vehicle re-entering the earth's atmosphere. The walls are heated with quartz tube infrared lamps mounted on reflectors 5 inches from the chamber's external surfaces. The temperature of each wall is controlled independently with manually operated relays. Wall temperatures may be programmed to rise as rapidly as 100°F per minute. Air temperature within the chamber rises passively as a result of natural convection induced by the chamber walls. Preliminary investigations of tolerance to peak wall temperatures as high as 430°F are summarized, and a more detailed investigation of human physiological and psychological performance during a 400° peak exposure is described. Results of the latter indicate that rather large changes in cabin temperature of limited length may have small enough effect on pilot performance that they may be included in design of air and space vehicles, particularly in cases where significant savings in weight may be achieved. (Author)

PB 171 296 $0.50

Biomedical Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
ORGAN OF CORTI'S NEGATIVE INTRACELLULAR POLARIZATION, by Edward A. Rice. Rept. on Research on the Logical Structure and Function of the Nervous System. Jan 61, 10p. 8 refs. WADD Technical rept. 60-778.

DESCRIPTORS: *Ear, *Physiology, Cells (Biology), Polarization, *Nervous system, Anoxia.

The negative potential located between the basilar membrane and the reticular lamina of the guinea pig's cochlea was investigated using several types of electrodes from 3 to 24 microns in diameter. This potential was found intracellular in origin and located within the organ of Corti. The hypothesis that the negative potential found in the scala media of hypoxic animals represents a "leakage" of the organ of Corti's negative intracellular polarization is supported by these experiments. The negative intracellular polarization of the organ of Corti was found to exist during the life span of the microphonics. The significance of these findings in explaining the origin of microphonics is discussed. (Author)

PB 171 289 $0.50

Biomedical Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
PHYSIOLOGICAL INDEX OF STRAIN AND BODY HEAT STORAGE IN HYPERTHERMIA, by John F. Hall, Jr. and J. W. Polte. Rept. on Physiology of Flight. Jan 61, 19p. 8 refs. WADD Technical rept. 60-599.

DESCRIPTORS: Physiology, *Body temperature, *Hyperthermia, *Thermal stresses, Heat tolerance, Space flight, Storage

Intra- and inter-individual, as well as group, variability of a Modified Craig index of physiological strain and body heat storage was determined and their relationship defined for 5 sitting, nonacclimatized subjects wearing 1 clobody insulation and exposed 5 times to each of three heat stress levels: 38° C, 54° C, and 71° C at 10 mm Hg vapor pressure. A linear relationship between physiological strain and thermal stress range studied is shown, although individual variation is marked, especially at higher stress levels. A statistically significant correlation between strain index and body heat storage is shown. Individual and mean variations in heart and sweat rates, and skin, rectal, and body temperatures as related to body heat storage, are illustrated. Data show usefulness of the correlation between strain and heat storage in comparing overall strain resulting from exposure to dissimilar thermal environments for different periods of time. (Author)

PB 154 334 $1.10

Bryn Mawr Coll., Pa.
EFFECT OF CORTISONE ON PROTEIN LOSS AND CARBOHYDRATE GAIN IN NORMAL AND ALTITUDE-EXPOSED MICE, by L. Joe Berry and Dorothy S. Smythe. Sep 60, 9p. 18 refs. AFSAM rept. 60-89; AD-250 045.

DESCRIPTORS: Nitrogen, *Carbohydrates, High altitude, Metabolism, Excretion, Excision, Enzymes, Adrenal glands, Liver, Biochemistry, Bacterial toxins, ACTH, *Adrenal cortical extract, Urine, *Proteins.

After injection of cortisone in fasted normal mice, protein catabolism and carbohydrate synthesis were equal, but in fasted altitude-exposed mice (simulated 20,000 ft. 3 to 5 wk) there was less carbohydrate than protein. In fed mice of both groups a balance between protein loss and carbohydrate increase was observed after cortisone administration, but the absolute quantities were less in altitude-exposed animals. Fasted altitude-exposed mice excreted more urinary N than controls. Administration of bacterial endotoxin to the hypoxic group decreased the urinary N to normal levels. Altitude-exposed mice were significantly more susceptible to endotoxin than normal mice were. Glutamicoxaloacetic and glutamic-pyruvic transaminases were lower in the livers of altitude-exposed mice than in normal animals. These enzymes were also lower four weeks after adrenalectomy. (Author)

PB 154 322 $2.60

California U., Los Angeles. School of Medicine.
NERVOUS CONTROL OF SHIVERING. VIII. FURTHER OBSERVATIONS ON BRAINSTEM UNIT POTENTIALS DURING SHIVERING, by Walter J. Freeman and Allan Hemingway. July 60, 30p. 26 refs. AAL Technical rept. 58-4; AD-251 853.

DESCRIPTORS: *Exposure, *Shivering, Electric potential, Brain, Physiology.

In 88 cats, during shivering elicited by cooling the skin under pentobarbital, continually active unit potentials were sought with stainless steel microelectrodes. Shivering and all unit potentials associated with shivering were found to be transiently inhibited by a brief nociceptive stimulus applied to the skin. Active points were marked by electrolytic deposits of iron. Of 52 points, 14 were in the nucleus of the field of Forel, 11 in the central tegmental fasciculus, 5 in the tectospinal tract, and 10 in the lateral reticular nucleus of the medulla and the adjacent white matter. The remaining 12 were scattered among such structures as the facial nerve and the brachium conjunctivum. No active points were found in any part of the red nucleus, cerebral peduncles, or inferior olives. A review of the literature and of experimental data indicated that a fiber tract, which is active during shivering, desends from the nucleus of the field of Forel in the central tegmental fasciculus and joins with the rubrospinal tract to pass to or through the lateral reticular nucleus of the medulla. The functional characteristics of the units indicate that they are involved in the coordination of muscular movements in shivering rather than in the central potentiation of shivering. (Author)

PB 154 023 $3.60

Duntley, S. Q., La Jolla, Calif.
OPTIMUM FIXATION PERIOD FOR VISUAL SEARCH, by James L. Harris, Rept. no. 3-4 on Contract NObs-72039. Mar 59, 32p. 6 refs. AD-217 152.

DESCRIPTORS: *Visual perception, Statistical analysis, *Target recognition, Vision, *Targets, Visibility.

Sample calculations are illustrated which utilize the most recent psychophysical-visual data. The technique is extended to allow determination of the optimum fixation period for a specified visual search task. This optimum is a function of the search geometry, the adaptation level, and the closing velocity. The methods outlined in this study are a necessary step in visual search calculations in order that the results may be viewed as the best possible performance. This does not imply that the observer can adjust his fixation period to any desired value, but psychophysical investigation should be made of the degree to which the observer is capable of such adjustment.

PB 154 100 $1.10

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THE EFFECT OF ULTRASOUND ON BIOLOGICAL TISSUE, by E. Kelly. Annual progress rept. for 1 Dec 58-29 Apr 60 on Contract Nonr-1834(20). [1960] 8p. 30 refs. AD-236 280.

DESCRIPTORS: *Ultrasonics, *Tissues (Biology), *Muscles, *Ultrasonic radiation, Physiology, Nervous system, Hematology, Pituitary gland, Sound.

The effects of high intensity ultrasound on the mechanical and electrical responses of excised frog skeletal muscle were studied. Results indicated that if high intensity ultrasonic field is applied to a muscle at low temperatures (below 18°C) the isometric twitch tension of the muscle decreases while the sound field is being applied. If the same sound field is applied to a muscle at high temperatures (about 20°C) the isometric twitch tension increases while the sound field is applied. In both cases the muscle returns to its original value of twitch tension when the sound field is turned off. In the region of 18° to 20°C there are only very small changes in the isometric twitch tension as the sound field is applied to the muscle. The theoretical calculations of the average temperature rise in the muscle, as a result of the applied sound field, check quite closely with the calculated and observed changes in isometric twitch tension for such temperature changes.

PB 154 321 $1.60

Virginia U. Medical School, Charlottesville.
A STUDY OF GROSS BODY COMPOSITION OF SMALL ALASKAN MAMMALS AS COMPARED WITH THOSE FROM THE TEMPERATE ZONE. I, by Grover C. Pitts. Sep 60, 16p. 11 refs. AAL Technical rept. 57-46; AD-251 852.

DESCRIPTORS: Mammals, Body fat, Body weight, Body fluids, Climate, Alaska, Physiology.

A collection was made of 63 mammals from Alaska and 62 from Virginia. This collection was made under natural conditions and represented 13 families, 25 genera, and 30 species. These mammals were dissected into 11 components (heart, liver, kidneys, spleen, gut, CNS, skin, muscle, bone, adipose tissue, and remainder), and the following values were determined: fresh weight, percentage of fat, percentage of water, and fat-free weight. The distribution of fat and the fractional composition of the fat-free body with respect to the 11 gross components were expressed in tabular form. An indiscriminate plot of data from all specimens reveals that fatness and body size are statistically related, inversely in animals with fat-free body weights below 300 grams, and directly in animals with fat-free body weights above 300 grams. Body fatness and percentage of fat in separable adipose tissue are directly related. No interpretation of these results has been attempted as yet. Statistical and graphical analyses, which will undoubtedly reveal other relationships, are still in the initial stage. (Author)

PB 154 017 $2.60

Visibility Lab., U. of California, San Diego.
PREDICTING THE DETECTION RANGE OF A TARGET IN A MOVING FIELD OF VIEW. A REVIEW OF RELEVANT RESEARCH PUBLISHED PRIOR TO 1957, by A. Morris. Rept. on Contract NObs-72092. Dec 59, 21p. 76 refs. SIO Ref. 59-69; AD-231 630.

DESCRIPTORS: *Targets, Detection, *Visual acuity, *Visual perception, *Visual thresholds, *Target recognition, Bibliography, Visibility.

Detection of a target moving through the visual field depends in part upon the effective stimulus duration which can be derived from the target size, speed and range. The various components of the target pattern will become large enough to be discriminated as discrete, and the fine details will be of sufficient angular separation to be resolved. Thus, as the observer approaches the target his contrast sensitivity and visual acuity threshold requirements will be met, and with the cumulative perception of the various elements of the target pattern, recognition will occur. There is considerable evidence to show that acuity is significantly reduced by movement. For detection of a target the eye requires sufficient effective energy; for recognition, it requires time. The Duntley calculation for detection assumes that ground targets moving with respect to the line of sight can be equated to targets flashed onto the center of the field for a single brief exposure, equal in duration to the time required for the target to move across a point on the retina. If this assumption is correct, after predicted detection, target fixation can be assumed and probable recognition ranges be derived using appropriate visual acuity data. The major references which report experimental data on visual thresholds for static and moving targets are reviewed and discussed. The visibility of a stationary target varying with exposure time is compared to that of a target moving at various angular velocities relative to the observing eye.

PB 154 323 $10.50

Washington U., Seattle.
HUMAN ACCLIMATIZATION TO COLD. A SELECTED, ANNOTATED BIBLIOGRAPHY OF THE CONCEPTS OF ADAPTATION AND ACCLIMATIZATION AS STUDIED IN MAN, by L. D. Carlson and H. L. Thursh. Sep 60, 135p. 64 refs. AAL Technical rept. 59-18; AD-251 854.

DESCRIPTORS: *Exposure, Physiology, Bibliography, Metabolism, Blood circulation, *Shivering, Biophysics, Climate, Man.

PB 154 324 $6.60

Washington U., Seattle.
PROTECTION OF THE EXTREMITIES IN EXTREME COLD: A SELECTED, ANNOTATED BIBLIOGRAPHY, by L. D. Carlson and H. L. Thursh. Oct 60, 64p. 29 refs. AAL Technical rept. 59-19; AD-251 855.

DESCRIPTORS: *Exposure, Bibliography, Physiology, Biophysics, Blood circulation, Therapy, *Arms, *Legs, Countermeasures, *Heat production (Biology).

PB 154 325 $5.60

Washington U., Seattle. School of Medicine.
ENVIRONMENTAL FACTORS INFLUENCING THERMAL EXCHANGE, by Thomas Adams. Sep 60, 57p. 97 refs. AAL Technical rept. 59-22; AD-251 856.

DESCRIPTORS: *Body temperature, *Heat production (Biology), Physiology, Heat transfer, Convection, Evaporation, Thermal radiation, Temperature control, Biophysics, *Heat, *Exposure.

The existence of a thermodynamic steady state depends not only on a critical adjustment of the several physiological mechanisms involved in temperature regulation, but more importantly on the characteristics and the multifaceted nature of the environment to which the animal is exposed. It is this steady state that allows the homeotherm to maintain a relatively stable internal body temperature. This paper attempts to present a first-order description of the physical phenomena that are ultimately involved in heat fluxes and the so-called avenues of thermal exchange; that is, conduction, convection, radiation, and evaporation. Some degree of understanding of these basic principles is required for even a partial appreciation of the physiological mechanisms involved in temperature regulation. The paper should be regarded perhaps as a primer rather than a comprehensive treatise. (Author)

Biochemistry

PB 171 271 $1.00

Karolinska Institutet, Stockholm (Sweden).
THE BEHAVIOR OF PROTEIN-FREE NUCLEIC ACIDS IN CHROMATOGRAPHY AND ELECTROPHORESIS AS WELL AS THEIR CHEMICAL AND BIOLOGICAL REACTIVITY, by C. G. Heden. Final technical rept. for Feb 60-Feb 61 on Methodological Studies on the Fractionation of Biologically Active Components of Bacterial Cells, Contract DA 91-591-EUC-1395. [1961] 29p.

DESCRIPTORS: *Nucleic acids, *Chromatographic analysis, *Electrophoresis, *Fractionation, *Cells (Biology), *Bacterial toxins.

Open-ended Terms: Counter flow electrophoresis

Experience gained with physicochemical separation of H. pertussis protein and nucleic acids on 3, 2 meter long columns led to the development of a new technique permitting the same resolution on 40 cm and still shorter columns. The method is called counter flow electrophoresis. During electrophoresis a flow of buffer is directed in the opposite direction to that of the cell components migrating towards the anode. The comparatively weakly charged proteins are driven out through the top of the column to a fraction collector by the buffer flow. The nucleic acids which have a much higher and negative charge migrate against the buffer flow and are eluted from the lower end of the column after the electrical connection has been broken. A column of optically pure silica with the dimensions 400 x 2 mm was made for the Cfe-preparation of phage DNA, and a 3 meter long silica column (1.4 mm diameter) for the long way Cfe-resolution of NA. The silica columns are designed for unsupported runs (no packing material) at 20-25 V/cm very low buffer concentrations and temperatures below zero.

PB 154 335 $1.10

School of Aviation Medicine, Brooks AFB, Tex.
MEASUREMENT OF CHOLESTEROL UPTAKE BY SERUM, by Dale A. Clark, Carrie B. Haven, and John J. Franks. Oct 60, 8p. 12 refs. Rept. 61-1; AD-250 047

DESCRIPTORS: *Cholesterol, Serum, Lipoproteins, Metabolism, Biochemistry, Alcohols

The capacity of human serum to dissolve cholesterol is measured by incubating crystalline cholesterol with serum at 37 degrees C. for 4 hr. filtering off the undissolved cholesterol and determining the cholesterol concentration in the filtrate. To saturate the serum with cholesterol under these conditions, the amount of cholesterol added must be approximately 200 mg. /ml. serum, although the amount of cholesterol dissolved is only 0.2 to 0.8 mg. /ml. serum. Factors such as incubations vessels, solvents, and variations in batches of cholesterol have definite effect upon the experiment results. A procedure for preparing cholesterol and for determining cholesterol uptake by human serum is described. (Author)

Pathology

PB 154 436 $1.60

Army Chemical Research and Development Labs., Army Chemical Center, Md.
THE ACUTE INTRAVENOUS TOXICITY OF TETRAHYDROAMINOACRIDINE, by Anthony Van de Wal, Jr. Jan 61, 13p. 13 refs. CRDLR 3042; AD-249 413.

DESCRIPTORS: *Acridines, Chemical warfare agents, *Chemical warfare injuries, Toxicity, Therapy, Respiration, Cholinesterase, Inhibition, Dosage, *Amines.

Open-ended Terms: THA.

Five animal species were tested to determine the acute toxicity of tetrahydroaminoacridine (THA). The intravenous LD50 for THA was determined to be 8.01 mg/kg (range, 7.43 to 8.65 mg/kg) from tests on 104 animals. An LD1 of 4.20 mg/kg (range, 3.82 to 4.63 mg/kg) was extrapolated from these data. (Author)

PB 154 437 $.80

Army Chemical Research and Development Labs., Army Chemical Center, Md.
SOME EFFECTS OF CS ON GOLDFISH, by Clyde D. Barbour and Joseph B. Hunn. Dec 60, 8p. CRDLR 3045; AD-248 007.

DESCRIPTORS: *Fishes, *Chemical warfare agents, Effectiveness, Toxicity, Hemorrhage, Skin, Mucous membranes, Pathology.

Open-ended Terms: EA 1779, CS 1, CS 2, CS(PL)3507, CS(PL)3508, CS(PL)3615.

The effects of CS (EA 1779, o-chlorobenzylidene malononitrile) on goldfish were studied. Seven samples, synthesized in the laboratories or pilot plants in the United States and the United Kingdom, were used. The agents were dissolved in propylene glycol and then added to tap water in amounts sufficient to make the desired concentrations. The 10 controls, which had been placed in a battery jar containing 6 liters of tap water and propylene glycol equal in volume to that used with the maximum CS concentration, showed no ill effects after 48 hours. The 10 test subjects, after an initial reaction to the irritating compounds (at a concentration of 10 mg/liter), usually began to die after 2 to 3 hours. All seven CS samples acted as strong irritants, causing a secretion from the mucous membranes. The responses of the fish varied with the samples. Except for 2 samples, the compounds also caused petechial hemorrhages in the animals. Histological studies showed sloughing of the epithelium of the gills and pharynx, and scattered hemorrhages in the dorsolateral muscles. Differences in potency were noted among the samples. (Author)

PB 155 718 $1.60

Massachusetts Memorial Hospital, Boston.
THE ARTERIAL PRESSURE-VOLUME CURVE OF THE HUMAN EXTREMITY MEASURED IN VIVO. THE EFFECTS OF AGE, ARTERIOSCLEROSIS, AND ORAL UNSATURATED FATTY ACIDS, by J. Edwin Wood. Sep 60, 13p. 10 refs. AFSAM rept. 60-61; AD-245 178.

This report released for sale to the public 1 June 61

DESCRIPTORS: *Arteriosclerosis, *Blood pressure, *Fatty acids, Measurement, Arteries, Test methods, Therapy, Epidemiology, *Age.

Open-ended Terms: Plethysmograph

A new method is described for measuring the arterial pressure-volume curve of the extremity of man in vivo. The effects of (1) aging, (2) arteriosclerosis in the vessels of the extremity, (3) arteriosclerosis in vessels other than the extremity, and (4) small oral doses of unsaturated fatty acids upon the arterial pressure-volume curve were measured. Arteriosclerosis of the vessels of the extremity was associated with marked change of the arterial pressure-volume curve as compared with normal subjects. The unsaturated fatty acids had no effect on the arterial pressure-volume curve. (Author)

PB 153 899 $1.60

Michigan State U., East Lansing.
MECHANISM OF ADAPTATION TO A THREONINE-DEFICIENT DIET. I. BIOCHEMICAL ASPECTS OF A THREONINE DEFICIENCY, by Dorothy Arata. Sep 60, 19p. 14 refs. AAL Technical rept. 60-3; AD-249 796.

DESCRIPTORS: *Diet, *Threonines, *Nutrition Biochemistry, Metabolism, Amino acids, *Deficiency diseases, *Liver, Adenosine phosphates, Nucleotides, Fatty acids, Cytochrome c, Body fats, Oxidases, Inhibition, Pathology.

Sixty male Sprague-Dawley rats were divided into two groups and fed a 9% casein diet with and without a supplement of 0.36% threonine (threonine-deficient) for a 4-week period. At various intervals labile phosphorus, inorganic phosphorus, liver fat, DPN-cytochrome c reductase, and fatty acid oxidase activities were determined. In the threonine-deficient group, fatty acid oxidase and DPN-cytochrome c reductase activities and the concentration of labile phosphorus were depressed while a progressive accumulation of fat was observed. It was concluded that this accumulation of fat was probably due to a loss in the ability of liver to oxidize fatty acids which, in time, is probably reflective of the disturbed metabolism of adenosine triphosphate (ATP) and diphosphopyridine nucleotide (DPN), both cofactors for fatty acid oxidase. Thus, the initials biochemical lesion of a threonine deficiency may be an impairment in the synthesis of ATP and of DPN-cytochrome c reductase. (Author)

Pharmacology and Toxicology

PB 154 280 $2.60

Army Chemical Research and Development Labs., Army Chemical Center, Md.
EFFECTS OF PUFFER POISON ON NEUROMUSCULAR TRANSMISSION, by Joseph H. Fleisher, Paul J. Killos, and Charles S. Harrison. Dec 60, 27p. 23 refs. CRDLR-3046; AD-248 021.

DESCRIPTORS: *Neuromuscular transmission, *Poisons, *Fishes, Acetylcholines, Eye, Biosynthesis, Physostigmine, Toxicity, Paralysis, Respiration, Cholines, Inhibition, Nerves, Cholinesterase.

Puffer poison (PP) injected into the anterior chamber of the rabbit eye produces mydriasis and loss of accommodation to changes in light intensity. The pupillary effects can be demonstrated with or without prior excision of the superior cervical ganglion excluding a mechanism operating through excitation of adrenergic nerves. The mydriasis was not due to a paralysis of the sphincter pupillae because the muscle responded vigorously to intraocular injection of acetylcholine (ACh). There is also a marked reduction of ACh output by the rat diaphragm preparation after exposure to PP upon indirect stimulation. In both of these respects, the neuromuscular block produced by PP differs from that of atropine and curare, respectively. The failure of choline to decrease the toxicity of PP in vivo and the ineffectiveness of PP against ACh synthesis in vitro exclude a mechanism similar to that of Hemicholinium-3. The above findings and the antagonism exerted by eserine toward PP suggest that the effects of PP on neuromuscular transmission are mediated through combination of PP with cholinergic nerves and their nerve endings accompanied by inhibition of release of ACh. (Author)

OTS SB-443 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
TRANQUILIZERS AND STIMULANTS. Apr 61, 12p. 87 refs. OTS Selective Bibliography SB-443.

DESCRIPTORS: * Drugs, *Tranquilizing drugs, Bibliography.

A bibliography of reports listed in the two OTS monthly abstract journals: U. S. Government Research Reports and Technical Translations.

Radiobiology

ANL-6264 $2.75

Argonne National Lab., Ill.
BIOLOGICAL AND MEDICAL RESEARCH DIVISION. Semiannual rept. July-Dec 59, on Contract W-31-109-eng-38. Dec 60, 189p.

UCRL-9454 $0.75

California U., Berkeley.
EXPERIMENTAL SETUP AND DOSIMETRY FOR INVESTIGATING BIOLOGICAL EFFECTS OF DENSELY IONIZING RADIATIONS, by T. Brustad, P. Ariotti, and J. Lyman. Rept. on Contract W-7405-eng-48. 28 Oct 60, 30p.

LAMS-2514 $0.50

Los Alamos Scientific Lab., N. Mex.
CONSEQUENCES OF THE INHALATION OF INSOLUBLE PARTICULATE MATERIAL CONTAINING AN HYDROLYZABLE RADIONUCLIDE, by Harvey I. Israel. Rept. on Contract W-7405-eng-36. Dec 60, 11p.

UR-587 $1.25

Rochester U. School of Medicine and Dentistry, N. Y.
THE PHARMACODYNAMICS OF MULTIPLE INHALATION OF POLONIUM^{210} IN THE RAT, by H. L. Berke and A. C. DiPasqua. Rept. on Contract W-7401-eng-49. 7 Feb 61, 53p.

PB 154 306 $6.60

Southwest Research Inst., San Antonio, Tex.
DETECTION OF RADIATION INDUCED FREE RADICALS BY PARAMAGNETIC RESONANCE, by W. W. Bradshaw and F. K. Truby. Rept. no. 7 (Final) 14 Nov 57-13 May 59, on Contract DA 19-129-qm-1060. [1959] 67p. 7 refs. QFCIAF File no. S-538; AD-233 085.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Free radicals, Detection, Paramagnetic resonance, *Food, Radiation effects, *Fats, Meat, Water, Preservation.

An electron paramagnetic resonance spectrometer was used to study the free radical production and reactions in irradiated food constituents. At about -25°C, the free radical decay rate for tri-stearin is optimum for the onset of peroxide formation. Irradiation at -196°C produces free radical systems which are not equivalent to those produced by irradiation at -78°C. A correlation exists between the types and amounts of free radicals found in tristearin irradiated and stored under a variety of environmental conditions with the peroxide values of such samples. Investigations concerning the effect of unsaturation on the amount of radiation-induced oxidation indicated that the presence of unsaturation enhances the radiation-induced oxidation effects. The antioxidant α-tocopherol does not act through free radical destruction. AET (S, 2-aminoethyl-isothiuronium bromide hydrobromide) is a good free radical acceptor for irradiated albumin-water mixtures. Although this compound did not yield quantitatively reproducible results, considerable reduction in free radical content occurred in all cases tested. The presence of water in a protein food constituent apparently is an aid in reducing free radical concentration, at least when the irradiation is carried out at a temperature considerably lower than that of subsequent storage. In beef samples, a free radical appeared to be induced in a substance other than the protein or fat. At the end of five hours aging at 0°C, the electron paramagnetic resonance signal from beef was about double that to be expected from fat.

CHEMISTRY

PB 171 266 $2.00

Harvard U., Cambridge, Mass.
ORGANOSILICON COORDINATION POLYMERS, by Ronn Nels Minné. Doctoral thesis. Technical rept. on Contract Nonr-1866(13). May 60, 74p. 36 refs. AD-238 452.

DESCRIPTORS: *Silicon compounds, Organic compounds, *Polymers, Amines, Complex compounds, Synthesis, Silanes, Chlorides, Ethyleneamines, Chemical reactions, Chemical bonds, Silicon, Nitrogen.

Polymeric silylamines were prepared by reacting ethylene diamine with dimethyl, diphenyl, and dicyclohexyl dichlorosilanes. The coordination properties of the N in these compounds were studied by the reaction of a xylene solution of the polymer with 5 anhydrous metal

chlorides: thorium (IV) chloride, nickel (II) chloride, cobalt (II) chloride, beryllium chloride, and copper (II) chloride. In the latter 3 cases, where the metal was appreciably soluble in organic donor solvents, a significant amount of metal ion was taken up by the polymer chain. Where the metal could form a square-planar coordination intermediate, the silylamine polymer rearranged to give a cross-linked silazane polymer, splitting out ethylene diamine. In the case of copper, with square-planar coordination geometry, the rearrangement was quantitative at the temperature of refluxing xylene. With beryllium ion, where coordination is presumed to be tetrahedral, the rearrangement was nearly completely blocked. Cobalt ion coordinated to the silylamine polymer and rearrangement took place, but not as completely as with copper ion. The linear silylamine polymers hydrolyzed more rapidly than the cross-linked silazane polymers. Coordination of the N atoms in the silylamine with beryllium greatly reduces the tendency for the Si-N bond to hydrolyze. The diphenylsilylamine polymer underwent rearrangement in the presence of copper (II) ions, but that no coordination polymer was formed, probably for steric reasons.

PB 171 272 $2.00

Little, Arthur D., Inc., Cambridge, Mass.
THE USE OF ORGANOMETALLIC COMPOUNDS IN PURIFICATION OF MAGNESIUM, CALCIUM, MERCURY, GALLIUM, RHENIUM AND NICKEL, by A. R. Gatti and W. A. G. Graham. Final rept. on Contract AF 19(604)4975. 31 Dec 60, 71p. 66 refs. AFCRL 99; AD-252 563.

DESCRIPTORS: *Metalorganic compounds, *Magnesium, *Calcium, *Mercury, *Gallium, *Rhenium, Nickel, *Purification, Metals, Electrolysis, Photolysis, Pyrolysis, Semiconductors.

Results of an experimental program devoted to the purification of metals by the use of organometallic compounds are described. Magnesium can be electrodeposited from ethylmagnesium hydride solutions but high purity has not been achieved. Organocalcium compounds are not suitable intermediates for calcium purification. Ultrapure mercury was prepared by decomposition of diethylmercury with ultraviolet light. Organogallium compounds did not yield gallium when exposed to ultraviolet light, and on thermal decomposition gave a product contaminated with carbon. High-purity rhenium was prepared from rhenium carbonyl by thermal decomposition. Exploratory experiments on nickel carbonyl pyrolysis were carried out.

PB 154 415 $1.60

Ohio State U. Research Foundation, Columbus.
CONCERNING THE STABLE PHASE OF SILICON MONOXIDE, by A. T. Chapman, G. R. St. Pierre and others. Rept. on Contract AF 33(616)3189. Dec 60, 19p. 3 refs. ARL Technical note 60-154; AD-251 786.

DESCRIPTORS: *Silicon compounds, *Monoxides, *Phase studies, *Stability, Pressure, Thermodynamics, Chemical reactions, Oxygen, Carbon.

The report is concerned with a portion of the Si-O-C system, and is specifically directed to the question of SiO possibly existing as a condensed phase at pressures below one atmosphere and temperatures between 1500°K and 1900°K. Largely on the basis of thermogravimetric experiments and vitreous-silica Knudsen cell experiments, it is concluded that under the aforementioned conditions of temperature and pressure SiO has stability only as a gas phase. It is further concluded that greater experimental precision would lead to independent thermodynamic data for SiO and the reactions whereby it is produced from SiO_2. (Author)

Analytical Chemistry

BMI-1508 $0.75

Battelle Memorial Inst., Columbus, Ohio.
THE DEVELOPMENT OF RADIOACTIVE-TRACER QUALITY-CONTROL SYSTEMS, by Robert Lieberman, Charles W. Townley and others. Topical rept. on Contract W-7405-eng-92. 27 Mar 61, 26p.

TID-11306 $1.50

Nuclear-Chicago Corp., Des Plaines, Ill.
EXPLORATION OF RADIOMETRIC METHODS FOR INDUSTRIAL PROCESS CONTROL, by William J. Driscoll, Benjamin F. Scott, and Edmund A. Huff. Final rept. on Contract AT(11-1)-695. 28 Feb 61, 62p.

Y-1351 $0.50

Union Carbide Nuclear Co., Oak Ridge, Tenn.
DETERMINATION OF URANIUM IN DIBUTYL CARBITOL BY MONOCHROMATIC X-RAY ABSORPTION, by T. H. Barton Jr., and C. M. Neff. Rept. on Contract W-7405-eng-26. 1 Mar 61, 13p.

Y-1348 $0.50

Union Carbide Nuclear Co., Oak Ridge, Tenn.
THE DETERMINATION OF URANIUM IN THE PRESENCE OF YTTRIUM BY MONOCHROMATIC X-RAY ABSORPTION, by T. H. Barton, Jr. Rept. on Contract W-7405-eng-26. 1 Mar 61, 10p.

Physical Chemistry

ANL-6339 $1.00

Argonne National Lab., Ill.
HIGH PURITY URANIUM COMPOUNDS, by H. J. Eding and E. M Carr. Final rept. on Subcontract to Contract W-31-109-eng-38. 15 Jan 61, 39p.

PB 154 356 $1.10

Arkansas U., Fayetteville.
MECHANISM OF THE ISOTHERMAL DECOMPOSITION OF POTASSIUM PERCHLORATE, by Kurt H. Stern and Marijon Bufalini. Rept. on Contract AF 49(638)653. [1960] 7p. 5 refs. AFOSR-TN-60-749; included in AD-248 496.

DESCRIPTORS: *Perchlorates, *Potassium compounds, *Decomposition, Oxygen, Isotopes, Exchange reactions *Chemical reactions.

The exchange between an O^{18} atmosphere and decomposing $KClO_4$ has been studied and found to be negligible. The rate determining step of the decomposition is the removal of atomic oxygen from the perchlorate ion. (Author)

BNL-644 (T-205) $0.50

Brookhaven National Lab., Upton, N. Y.
DIFFUSION OF IODINE THROUGH ALUMINUM, by A. W. Castleman, F. E. Hoffmann, and A. M. Eshaya. Sep 60, 10p.

PB 154 072 $7.60

Howe Sound Co., Salt Lake City, Utah.
ELECTRODEPOSITION OF COBALT BASE ALLOYS, by W. Martin Fassell, Jr. and John P. Baur. Interim technical rept. 1 Oct 56-1 Apr 57 on Contract DA 04-495-505-ORD-862. 31 July 57, 76p. 11 refs. WAL-317/6-1; AD-157 789.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Cobalt alloys, *Electrodeposition, Nickel alloys, Iron alloys, Adhesion.

Co-Ni and Co-Fe binary alloys were electrodeposited from mixed sulfate, mixed chloride, and mixed Watts type baths. Variables investigated included bath composition, temperature, current density, solution pH, and anode type. Special emphasis was placed on relative adherence of Co-Ni alloys deposited from mixed sulfate baths on SAE 4140 steel. An apparently satisfactory pretreatment is described involving anodic etching in a solution of oxalic acid. Electrodeposits of similar composition were obtained from the 3 bath types having the same ion ratio, the choice of bath being determined by the physical properties of the deposit. Electrodeposits from mixed sulfate baths appeared to be brighter and smoother than those from the mixed chloride or mixed Watts type although no physical measurements were made. (Author) (See also PB 140 954)

PB 154 443 $5.60

Imperial Coll. of Science and Tech., London (Gt. Brit.)
ADSORPTION AND SORPTION COMPLEXES. Final technical rept. for Jan-Oct 60 on Contract DA 91-591-EUC-1368. [1960] 54p. 53 refs. AD-250 883.

DESCRIPTORS: Adsorption, *Iodine, *Crystals, Measurement, Absorption, Porous materials, Lattices, Crystal structure, *Phase studies, *Thermochemistry, *Organolites

Open-ended Terms: Chabazite, Linde Sieve A, Faujasite.

The occlusion of iodine was measured in the range 120 to 300 C in crystals of chabazite, Linde Sieve 5A and near-faujasite (Linde Sieve 13X). The families of occlusion isotherms obtained were fully reversible and served for determinations of the partial molal heat of occlusion, Delta H, over wide ranges in amounts of iodine sorbed increased, the values of Delta H were initially very large, decreased rapidly to a minimum, and then rose slowly to a low maximum. Thereafter they fell rapidly towards the heat of vaporization of iodine. The form of these curves was discussed and interpreted. Calculations of the iodine-lattice interaction give considerable information about preferred sites in the lattice and the paths preferred by the iodine molecule in movement. The calculated energy is in satisfactory agreement with that observed and intracrystalline iodine-iodine interaction energy is compatible with that for ordinary molecular iodine. (Author)

TID-7607 $2.00

Oak Ridge National Lab., Tenn.
PLUTONIUM ION EXCHANGE PROCESSES. Proceedings of the US-UK Technical Exchange Meeting, Oak Ridge National Laboratory, 25-27 Apr 60. Feb 61, 75p.

PB 154 299 $7.60

Stanford Research Inst., Menlo Park, Calif.
THE ENERGY OF POLYMERIZATION OF THE GASEOUS ALKALI HALIDES, by Daniel Cubicciotti and Thomas A. Milne. Technical rept. (Final) on Contract AF 49(638)89. Dec 60, 73p. 50 refs. SRI Project SU-2024; AD-249 874.

DESCRIPTORS: *Polymerization, *Alkali metal compounds, *Halides, Gases, Energy, Heat of formation, Chemical bonds, Chlorides, Mass spectroscopy.

An investigation was made of the energy relationships among the important molecular forms in the gas and the condensed phases of the alkali halides. In particular, the energy of formation of polymers (such as dimers, Na2Cl2 trimers, Na3Cl3, etc.) from their monomers (i.e., NaCl) has been investigated. The binding energy of the polymeric molecules relative to the monomeric form has been determined for the alkali halides both experimentally and theoretically and some insight into the nature of their interatomic forces has been gained. (Author)

NYO-9470 $1.50

Tufts U., Medford, Mass.
A SURVEY REPORT ON LITHIUM HYDRIDE, by Charles E. Messer. Rept. on Contract AT(30-1)1410. 27 Oct 60, 58p.

PB 155 707 $2.60

Ultrasonic and Electrochemistry Research Lab., Western Reserve U., Cleveland, Ohio.
THE ELECTROCHEMICAL PROPERTIES OF DILUTE SODIUM AMALGAMS, by Harry Dietrick, Ernest Yeager, and Frank Hovorka. Technical rept. no. 3 on Contract Nonr-581(00). 1 Apr 53, 23p. 11 refs. AD-7512.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Mercury alloys, *Sodium alloys, *Electrochemistry.

The electrochemical properties of dilute Na amalgams were studied in terms of electrode potentials, self-discharge rates, and anodic polarization. At current densities as high as 1 amp/sq cm, the anodic polarization (as determined by the commutator method) was negligible in an agitated system. Self-discharge rates were also very small for liquid amalgams in NaOH solutions because of the depression of the electrode potential of the Na in the amalgam and the relatively high H overvoltage of Hg. In part, the depression of the potential of Na in Hg was associated with the formation of an $NaHg_{16}$ type compound. The relatively high electrode potential and nonpolarizability of liquid Na amalgams suggest their use in high-drain primary cells. The disadvantages accompanying the use of Na amalgams in cells are (1) the weight of the Hg and the relatively low Na content of liquid amalgams, and (2) the fact that solid Na amalgams corrode rapidly and polarize readily.

EARTH SCIENCES

PB 154 116 $9.10

Columbia U., New York.
QUANTITATIVE ANALYSIS OF LONGITUDINAL STREAM PROFILES OF SMALL WATERSHEDS, by Andy J. Broscoe. Technical rept. no. 18 on Contract N6onr 271-30. 1959. 104p. 75 refs. AD-233 820.

DESCRIPTORS: *Hydrology, Estuaries, Erosion, *Geology, *Terrain, Analysis, Surface properties.

Contents:
Stream profiles of small watersheds
Methods of investigation
Selection of test areas
Stream orders
Methods of map analysis
Reliability of map measurements
Field methods
Statistical analysis of H, L, and H/L data
Method of single-channel profile plotting
Reference points in profile plotting
Regressions of channel slope on distance
Method of plotting composite profiles
Theoretical considerations of profile form
Causes of up-concavity in stream profiles
Mathematical equations of longitudinal stream profiles
Salt Run area
Highlands Ranch area
Long Canyon area
Manitou Park area
Widow Woman Canyon area
Chileno Canyon area

Climatology and Meteorology

BNL-635 (T-198) $0.50

Brookhaven National Lab., Upton, N. Y.
A STUDY OF THE WIND PROFILE IN THE LOWEST 400 FEET OF THE ATMOSPHERE, by Irving A. Singer and Constance M. Nagle. Progress rept. no. 7, 16 May-15 Sep 60, on Contract R-65-8-99812 SC-04-91, DA Proj. 3A99-07-001-03. Sep 60, 20p.

PB 153 913 $3.60

Dublin Inst. for Advanced Studies (Eire).
DESIGN AND CONSTRUCTION OF A CONTINUOUSLY SENSITIVE DIFFUSION CLOUD CHAMBER FOR STUDYING THE BEHAVIOR OF ICE NUCLEI. Final technical rept. no. 1, 1 Nov 59-31 Oct 60, on Contract DA 91-591-EUC-1282. [1960] 35p. 10 refs. AD-249 143.

DESCRIPTORS: *Cloud chambers, Design, *Ice, Particles, *Clouds, Condensation, Diffusion, Sensitivity, Simulation, Counting methods.

The construction of a diffusion cloud chamber for detecting and counting natural and artificial freezing nuclei is described. The resolving power and accuracy is increased by arranging the temperature gradient horizontally and assigning to each temperature step a separate compartment. To avoid or reduce convection currents in the compartments, the continous temperature change in the metal plates which form the bottom and top of the compartments is such that the temperature at the floor of each compartment is lower than at its top. The sample to be investigated is drawn simultaneously into all compartments and the crystals which form in the chambers are recorded on appropriately coated slides or collected in dishes containing a sugar solution. It is proposed to use a photo-electric nucleus counter of high precision which is an expansion cloud chamber for determining ice crystals. The nucleus concentration indicated by a photo-electric counter decreases with its decreasing temperature. The decrease of extinction is directly proportional to the deviation of the temperature of its fog-tube and the sample therein from the calibration temperature. The rate of decrease in extinction decreases with decreasing extinction and the rate depends also on the size of the nuclei. The counter must be maintained at the calibration temperature and eventually, in a cold climate,

the aerosol to be investigated pre-heated in a wide tube system mounted in front of the counter when sampling. (Author)

PB 154 445 $8.10

General Mills, Inc., Minneapolis, Minn.
THE REVERSAL OF STRATOSPHERIC WINDS OVER NORTH AMERICA IN 1959, by Arthur D. Belmont. Scientific rept. no. 4 on Contract AF 19(604)6618. 20 Jan 61, 88p. GMI rept. 2156; AFCRL-221; AD-250 526.

DESCRIPTORS: *Stratosphere, *Wind, Wind direction indicators, Frequency, Meteorological data, North America.

The spring and fall reversal of prevailing stratospheric zonal wind direction during 1958 is described and compared to the "normal" pattern. The main feature of the spring 1959 reversal was its much earlier arrival than in the "normal" pattern or in 1957 or 1958. The persistent bands of westerlies in the tropics confirms the picture of prior years. The fall reversal occurs again between the latter half of August and the first half of September. (Author) (See also PB 149 309)

HW-67799 $1.00

Hanford Atomic Products Operation, Richland, Wash.
MEETING OF UNITED STATES ATOMIC ENERGY COMMISSION METEOROLOGY PROGRAM LEADERS, JUNE 20, 21, AND 22, 1960, ed. by J. J. Fuquay, P. W. Nickola, and R. J. Engelmann. Rept. on Contract AT(45-1)-1350. 33p.

PB 153 651 $3.60

Illinois State Water Survey, Urbana.
STUDY ON INTENSITY OF SURFACE PRECIPITATION USING RADAR INSTRUMENTATION, by E. A. Mueller and G. E. Stout. Quarterly technical rept. no. 10, 1 July-30 Sep 60, on Contract DA 36-039-sc-75055. [1960] 36p. 5 refs; AD-248 051.

DESCRIPTORS: *Precipitation, *Meteorological radar, Raindrops, Intensity, Meteorological data, Radioactive fall-out, Measurement, Military communications, Trafficability, Radar equipment, *Photographic analysis, Cameras.

Open-ended Terms: CPS-9.

A summary of the operation of raindrop cameras is given. Satisfactory operations of one year of raindrop cameras at Miami, Florida; Corvallis, Oregon; Majuro Marshall Islands; and Woody Island, Alaska were obtained. The means of reducing raindrop data was reviewed. An automatic means of transferring measurements from the projection table to IBM cards was built. Preliminary analysis of the drop data is reviewed. Some results are given from the Miami data. A summary of the problem of rainout is discussed. (Author)

PB 153 912 $11.50

Johannes Gutenberg U. (West Germany).
ADVANCED INVESTIGATIONS OF THE VISUAL RANGE UNDER OVERCAST SKY (VISUAL RANGE AND ALBEDO ESPECIALLY IN POLAR REGIONS), by F. Kasten and F. Möller. Final technical rept. for 1 Nov 59-31 Oct 60 on Contract DA 91-591-EUC-1300. 30 Nov 60, 157p. 47 refs. AD-249 165.

DESCRIPTORS: *Visibility, *Albedo (Astronomy), Arctic regions, Reflectometers, *Sky brightness, Sky, Luminescence, Range, *Clouds, Snow, Visual perception, Meteorology.

The theory of the horizontal visual range (V) of objects which are not self-luminous under overcast skies is considered. V is dependent on the diameter and visual albedo of the object, on the visual albedo of the ground, and on the visual extinction coefficient of the air. Results of measurements of the parameters are given.

PB 154 568 $9.10

Research and Advanced Development Div., Avco Corp., Wilmington, Mass.
SPREAD F, by Rudolph B. Penndorf. Scientific rept. no. 7 on Research Concerning Forecasting Anomalous Propagation at High Latitudes, Contract AF 19(604)4092. Nov 60, 103p. 35 refs. Technical rept. RAD-TR-61-1; AFCRL-TN-60-1162; AD-250 899.

DESCRIPTORS: *Ionosphere, Propagation, Mathematical prediction, Upper atmosphere, Northern hemisphere, Ionospheric disturbances, Ionosphere models, Atmospherics, Diffusion, Electromagnetic wave reflections, Arctic regions, Radio waves.

Open-ended Terms: Spread-F.

The occurrence of spread F in the polar region is investigated. The traveling maximum moves along the auroral belt, whereas the permanent maximum is situated over the Canadian Archipelago and remains there during the day. The results are interpreted in relation to the magnetic field and F-layer disturbances. The analysis of ionograms leads to a new classification scheme and the definition of a spread-F index. Suggestions for improving the scaling procedures are made.

PB 156 006 $5.60

Stanford Research Inst. [Menlo Park] Calif.
EVALUATION OF FOG DISPERSAL METHODS, by Lowell G. Wayne and Gordon B. Bell, Jr. Quarterly progress rept. no. 3, 16 Apr-16 July 53, on Contract NOas 53-005-C. 16 July 53, 59p. 37 refs. SRI Proj. CU-748.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Fog, Countermeasures, Scattering, Airplane landings, Meteorology, Tests.

Individual consideration has been given to the characteristics of a number of suggested fog dispersal systems. Classified as nearly as possible according to the physical principles involved, these systems are further discussed with respect to their potentialities for practical application to fog dispersal on airfields or on aircraft carriers. In addition to their theoretical feasibility, other aspects treated include suitability for various weather conditions, and bulk and portability of necessary installations, as well as relative expense of installation and operation. As an example of a possible approach to the problem of economy in the use of heat for dispersing fog, theoretical estimates are made of the probable dimensions of clearing attainable with an arbitrarily selected energy output. (Author)

PB 154 040 $6.60

Visibility Lab., U. of California, San Diego.
A COMPRESSED-SCALE SYSTEM OF PORTABLE VISIBILITY LIGHTS. Rept. on Contract NObs-72092. Mar 60, 61p. 4 refs. SIO Ref. 60-16; AD-241 369.

DESCRIPTORS: *Visibility, Atmosphere, *Meteorological instruments, *Weather forecasting, Meteorology, Light transmission, Lighting systems, *Searchlights.

A description is presented of a compressed-scale, battery-operated, portable system of visibility lights intended primarily for use at dispersal and other tactical bases where adequate night visibility check points are not available. The system preferred by the Air Weather Services for making meteorological observations of visibility at night consists of (1) a battery-operated searchlight; (2) a series of reflectors of the retrodirective type which are located at selected distances from the searchlight; and (3) a human observer, equipped with a battery-operated viewbox to control his visual adaptation, who is stationed near the searchlight.

Geodesy

PB 171 269 $1.75

Air Force Cambridge Research Labs., Bedford, Mass.
RESEARCH AND DEVELOPMENT IN THE FIELD OF GEODETIC SCIENCE, by Clair E. Ewing (Industrial Coll. of the Armed Forces). Thesis. Aug 60, 67p. 22 refs. Air Force Surveys in Geophysics no. 124; AFCRL TN-60-435.

DESCRIPTORS: *Geodesics, Scientific research, Electronic systems, Radio navigation, Radio equipment, *Astronomical cameras, Gravity, Measurement, Solar eclipses, Stellar eclipses, *Geophysics, *Satellite vehicles.

This report briefly surveys significant research and development activities in geodesy, namely, arc measurements, electronic surveying, eclipses and occultations, moon camera, satellites, and gravity measurements.

PB 153 955 $9.60

General Mills, Inc., Minneapolis, Minn.
TESTS FOR THE AUTOMATIC POSITION SURVEY EQUIPMENT. Final rept. for 1 Apr 58-30 Nov 59 on Phase II, Contract DA 44-009-eng-3366. 30 Dec 59, 113p. Rept. no. 81515-1; AD-232 305.

DESCRIPTORS: *Geodesics, Position finding, Automatic, Tests, *Digital computers, *Data storage systems, *Magnetic recording systems, Astronomical data, Geodetic data.

The APSE system was demonstrated to perform astronomic position determination with a high degree of automation. Total time for the survey including computation of position was shown to be considerably less than present manual techniques. Accuracy of surveys using approximately 30 stars was short of the required 10 m for second order work. Repeatability of position computation was found to be in the range of 20 to 25 m. Use of an equal altitude type of instrument freed the system from precise positional measurements in leveling and azimuth but imposed severe accuracy limitations on transit time determinations. The unusual sensitivity of the two dimensional circle reduction problem to transit time variability poses a limitation in the ultimate accuracy attainable with the equal altitude method. Furthermore, accuracy of each transit in the single reference transit detector is limited by nature due to low frequency position motions of the stars. The result of all the analyses made on both field and simulated input data emphasizes that to obtain a second order accuracy in half of the surveys would require over 100 stars per survey. (Author)

Geology

PB 154 115 $1.60

Columbia U., New York.
RELATION OF MORPHOMETRIC PROPERTIES TO RUNOFF IN THE LITTLE MILL CREEK, OHIO, DRAINAGE BASIN, by Marie E. Morisawa. Technical rept. no. 17 on Contract N6onr-271, T. O. 30. 1959, 11p. 6 refs; AD-233 819.

DESCRIPTORS: Geology, *Drainage, Water, *Hydrology, Terrain, Analysis, Ohio.

Quantitative geomorphic characteristics of five subdivisions of Mill Creek watershed, Ohio, were correlated with hydrologic data. In such a small homogeneous basin factors of climate, structure, lithology and soil type are assumed to be minimized as significant variables. Significant regressions were obtained for average stream discharge on basin area, relief ratio, circularity, and elongation. Regressions for peak runoff on each of these morphometric measurements also proved to be significant. These relationships may prove useful in estimating stream flow in ungaged portions of drainage basins. (Author)

PB 154 117 $8.60

Columbia U., New York.
RELATION OF QUANTITATIVE GEOMORPHOLOGY TO STREAM FLOW IN REPRESENTATIVE WATERSHEDS OF THE APPALACHIAN PLATEAU PROVINCE, by Marie E. Morisawa. Technical rept. no. 20 on Contract N6onr 271, T.O. 30. 1959, 97p. 42 refs; AD-233 823.

DESCRIPTORS: Geology, *Drainage, Water, *Hydrology, Terrain, Analysis, Mountains.

Geometry of fifteen watersheds in the Appalachian Plateau province conforms to Horton's laws of drainage composition in horizontal, or planimetric properties, but not in vertical, or relief properties. Geologic structure and varying lithology act to change vertical form elements, causing deviations from Horton's laws. Geometric similarities and differences in watershed morphology provide both quantitative and qualitative bases for grouping the regions studied into three distinct sections. Dissimilarities, though distinct, are not great. Simple correlations of hydrologic and geomorphologic features provide the basis for choice of characteristics to use in a multiple regression on peak runoff intensity. A regression of peak intensity of runoff on basin area, rainfall intensity and frequency, and topography has a high correlation coefficient and is significant at the .001 level. Quantitative determinations of geomorphic properties of drainage basins thus have a practical use in basin hydrology. (Author)

Physics of the Atmosphere

PB 154 373 $2.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
DEVELOPMENT AND FLIGHT TEST OF A DEW POINT HYGROMETER UTILIZING THERMOELECTRIC (PELTIER) COOLING. HIGH ALTITUDE INSTRUMENTATION REPORT NO. IV, by George A. Dulk. Nov 60, 27p. 22 refs. Memo. rept. no. 1308; AD-250 470.

DESCRIPTORS: *Upper atmosphere, Humidity, Moisture, *Thermoelectricity, Cooling, Dew point, *Hygrometers, Balloons, Atmospheric sounding, Instrumentation, Flight testing, *Water vapor, Measurement.

A brief description of dew point hygrometer operation is given and Peltier effect theory is reviewed. Particular emphasis is placed on the construction of the instrument with the problems inherent in the utilization of thermoelectric materials. The flight test on a balloon is discussed and the test results presented and analyzed. (Author)

PB 154 067 $1.60

Deutscher Wetterdienst, Offenbach (West Germany).
THE CELL STRUCTURE OF THE ATMOSPHERE, by H. Faust. Final rept. on Contract DA 91-591-EUC-1295. Dec 60, 14p. AD-249 340.

DESCRIPTORS: *Atmosphere, Atmosphere models, Air mass analysis, Wind, Velocity, Statistical analysis.

Contents:
Setup of a model atmosphere on the least complex principles
Empirical-statistical investigations for an examination of the deduced model
Deductions from the derived model
Null layer charts
Double null layers
Mass flow in the null layer of second kind N2
Null layer and tropopause
Extreme winds in the troposphere and lower stratosphere of the northern hemisphere
Mean wind values
Study ot a specific weather situation
Relation of N1 to N2
Investigations of air density
Variation of scalar wind speed in the upper stratosphere
Large pattern climatology of unreported areas
Study of cold front passings
Meteorological gradients Berlin (Munich)

PB 154 042 $6.60

Visibility Lab., U. of California, San Diego.
ATMOSPHERIC OPTICAL MEASUREMENTS IN WESTERN FLORIDA, FLIGHT 112. PART I, by Almerian R. Boileau. Rept. on Contract NObs-72092. Apr 60, 69p. 2 refs. SIO Ref. 60-22; AD-241 370.

DESCRIPTORS: *Atmosphere, *Optical analysis, *Aerial photographs, Terrain, Analysis, Climatic factors, Florida, Catalogs.

A research program was conducted on optical image transmission through the atmosphere. Several data gathering flights were made in western Florida in the vicinity of Eglin Air Force Base in the spring of 1957. Photographic data are presented as a catalogue of the recorded optical measurements as they varied with altitude, time of day, azimuthal angle with respect to the sun, and meterological conditions. The distribution of the sky's luminance and radiance is not included. (Author)

PB 154 048 $8.60

Visibility Lab., U. of California, San Diego.
ATMOSPHERIC OPTICAL MEASUREMENTS IN WESTERN FLORIDA, FLIGHT 112. PART II. SKY LUMINANCES, by Almerian R. Boileau. Rept. on Contract NObs-72092. June 60, 92p. 2 refs. SIO Ref. 60-32; AD-246 323.

DESCRIPTORS: *Atmosphere, *Optical analysis, Optical images, *Sky brightness, Measurement, Photometers, Airborne, Azimuth, Flight testing, Catalogs, Florida.

The sky luminance distribution is presented in graphic form as it varied with altitude, zenith angle, and azimuth with respect to the sun. Sky radiance distribution will be presented at a later date. (Author) (See also PB 154 042)

PB 154 084 $8.60

Visibility Lab., U. of California, San Diego.
ATMOSPHERIC OPTICAL MEASUREMENTS IN WESTERN FLORIDA, FLIGHT 112. PART IV. SKY RADIANCE (RED), by Almerian R. Boileau. Rept. on Contract NObs-72092. Nov 60, 94p. 2 refs. SIO Ref. 60-56; AD-251 828.

DESCRIPTORS: *Atmosphere, *Optical analysis, Optical images, *Sky brightness, Measurement, Photometers, Airborne, Azimuth, Flight testing, Florida.

The sky radiance distribution is measured by a red light sensitive filter-phototube combination, and varies with altitude, zenith angle, and azimuth. (Author) (See also PB 154 042)

ENGINEERING

PB 154 355 $2.60

David Taylor Model Basin, Washington, D. C.
PROBLEMS SOLVED ON HIGH-SPEED COMPUTING EQUIPMENT OF THE APPLIED MATHEMATICS LABORATORY, SUPPLEMENT II, 1958-1959, comp. by H. Smith and L. Chatfield. Jan 61, 28p. Rept. 1295-2; AD-250 472.

DESCRIPTORS: *Digital computers, Programming, *Naval research, *Management engineering, Applied mathematics.

Brief descriptions of new problems programmed for solution on high-speed calculators are presented. These problems fall into two general categories: naval engineering, and management data analysis. (Author)

PB 155 595 $9.60

MSA Research Corp., Callery, Pa.
BTF PRESSURIZED BLOWDOWN TEST, by G. E. Kennedy and V. K. Heckel. Technical rept. 69 on Contract NObs-77023. 27 Nov 59, 117p. MSAR 59-130.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Pressure vessels, Test methods, Mathematical analysis, Pressure, Temperature, Measurement, *Reactors.

The purpose of this test was to obtain pressure vessel blowdown data to establish that the specific application of the mathematical model used to describe the reactor blown down is conservative. Thirty-six runs were made encompassing three variables: temperature (600-500-400 F); orifice size (3.75, 3, 2, 1.5, 1, 0.2 in.); and position (top or bottom discharge). In addition, six reruns were made to check the reproducibility of the data. The results of the test have been sent to WAPD (Bettis Plant) and KAPL for evaluation. The results are given in this report, but no conclusion or recommendations are given. (Author)

SCR-283 $0.50

Sandia Corp., Albuquerque, N. Mex.
GALVANOMETER ISOLATION PIER, by L. T. Wilson and L. H. Bressan. Feb 61, 14p.

Aeronautical Engineering

PB 171 786 $1.50

Borg-Warner Controls, Goleta, Calif.
ANALYSIS OF AVIATION METEOROLOGICAL REQUIREMENTS. PHASE II, VOLUME 1, by Eugene Bollay. Rept. on Contract FAA/BRD-139, 1 Aug 60, 57p.

DESCRIPTORS: *Air traffic control systems, *Meteorology, Air traffic, Scheduling, Air traffic controllers, Human engineering, Meteorological data, Analysis, Operations research.

This report summarizes the methods of analysis of the use and adequacy of currently provided meteorological information; current meteorological requirements of air navigation, traffic management operations, including air traffic control system and its users, and meteorological requirements through 1964; and requirements of the Weather Services through 1964.

PB 171 787 $3.50

Borg-Warner Controls [Goleta, Calif.].
ANALYSIS OF AVIATION METEOROLOGICAL REQUIREMENTS. PHASE II, VOLUME II-A. ANALYSES OF ATC AND AVIATION TO DETERMINE OPERATIONAL METEOROLOGICAL REQUIREMENTS (PRESENT - 1964), by Eugene Bollay. Rept. on Contract FAA/BRD-139. 1 Aug 60, 227p. 3 refs.

DESCRIPTORS: *Air traffic control systems, *Meteorology, Air traffic, Scheduling, Air traffic controllers, Human engineering, Operations research.

This volume presents the results of detailed analyses to identify and describe operational meteorological requirements for both the air traffic control system and the airspace users. (See also PB 171 786)

PB 171 788 $2.75

Borg-Warner Controls [Goleta, Calif.].
ANALYSIS OF AVIATION METEOROLOGICAL REQUIREMENTS. PHASE II, VOLUME II-B. ANALYSES TO DETERMINE AVIATION WEATHER SERVICE REQUIREMENTS (PRESENT - 1964), by Eugene Bollay. Rept. on Contract FAA/BRD-139. 1 Aug 60, 148p. 77 refs.

DESCRIPTORS: *Air traffic control systems, *Meteorology, Air traffic, Scheduling, Air traffic controllers, Operations research.

This volume presents an evaluation of operational requirements in terms of the weather service meteorological capability necessary to effectively satisfy these requirements. Conclusions are set forth and substantiated for weather system outputs, in terms of operationally useful observations and forecasts, and the improvements in the aviation weather service required to achieve these outputs. (See also PB 171 787)

PB 155 125 $7.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
STUDY AND INVESTIGATION OF METHODS OF DISSIPATION OF STATIC ELECTRICITY ON HELICOPTERS, by C. J. Tona. Rept. on Proj. 9R38-01-017-30, Contract DA 44-177-TC-544. Sep 60, 73p. 11 refs. Rept. no. BB-1368-H; TREC Technical rept. 60-55; AD-252 149.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Helicopters, *Static electricity, *Static eliminators, *Atmospheric electricity, *Electrical corona, Tests, Design, Test equipment, Hazards, Flight testing, Electrostatic fields, Exhaust systems, Helicopter engines, Radioactivity, Voltmeters, Effectiveness.

Various methods for eliminating the static charge on helicopters were considered and evaluated on the basis of test data derived from an intensive field test program. Both active and passive corona systems along with a radioactive device were installed in an H-37 aircraft for test evaluation. Passive discharge wicks were found to be limited in operating characteristics and the radioactive system presented problems relative to handling characteristics. The active corona discharge system provided adequate control of the aircraft charge potential and was concluded to be the most feasible approach to this problem area. (Author)

PB 154 711 $4.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
STUDY OF THE VTOL DOWNWASH IMPINGEMENT PROBLEM, by Richard P. White, Jr. and Robert J. Vidal. Rept. on Proj. 9R38-01-017, Task 29, Contract DA 44-177-tc-689. Nov 60, 46p. 14 refs. TREC Technical rept. 60-70; C.A.L. rept. no. BB-1467-S-1; AD-251 154.

DESCRIPTORS: *Vertical take-off planes, *Helicopters, *Downwash, Particles, Ground effect, Aircraft.

The results of an intensive review and analysis of the problems associated with dust and debris entrainment in the downwash of helicopters and other VTOL configurations during "near ground" operations are presented. Specific research programs are recommended to (1) obtain a better understanding of the problem, (2) to investigate ideas that have been proposed to reduce the entrainment and detrimental effects of particles, and (3) to investigate ideas that have been proposed for avoiding entrainment of objects by the downwash. (Author)

PB 150 732 $3.60

David Taylor Model Basin, Washington, D. C.
AERODYNAMIC RESPONSE OF A 7-FOOT GROUND-EFFECT MACHINE FLYING OVER UNEVEN SURFACES, by Anibal A. Tinajero and J. Norman Fresh. June 60, 34p. 2 refs. Rept. 1436; Aero rept. 982; TED TMB RAAD 3258; AD-242 806.

DESCRIPTORS: Ground effect, Aerodynamics, Aircraft, *Flying platforms, Model tests, Flight testing, Terrain, Hazards.

The results of dynamic and hovering tests of a 7-foot ground-effect machine flying over uneven surfaces is presented. The aerodynamic response when cruising over uneven surfaces is evaluated and compared to results obtained from the hovering stability parameter in pitch. It was found that ground-effect machines having a peripheral nozzle, when flying over surfaces with a sine-wave contour and increasing forward velocity, will eventually encounter a critical speed at which the pitch of the vehicle will be out of phase with the surface. If the amplitude of pitch becomes too great, collision will occur. The critical speed depends on the height at which the machine is flying, the ratio of vehicle length to surface wave length, and the amplitude of surface wave. In general, it can be said that the critical speed is a function of the stability derivative in pitch, the mass moment of inertia of the machine, the height at which the vehicle is flying, and the local acceleration of gravity. (Author)

PB 154 074 $2.60

David Taylor Model Basin, Washington, D. C.
THE HOVERING PERFORMANCE OF A TWO-DIMENSIONAL GROUND-EFFECT MACHINE OVER WATER, by Arthur E. Hirsch. Oct 60, 21p. 4 refs. Rept. 1426; AD-249 441.

DESCRIPTORS: *Ground effect; Machines; *Aircraft; Vehicles; Jets; Effectiveness; Water; Tests.

Open-ended Terms: Hydroskimmer

The performance in hovering of the Hydroskimmer, a rectangular ground-effect machine with longitudinal side curtains, designed for overwater operation, was investigated. Indications are that the simple momentum

theory for thin jets adequately describes the performance in hovering of this craft over both a fluid and solid surface. The performance of the Hydroskimmer is compared with that of other hovering craft. (Author)

PB 154 026 $1.10

Duntley, S. Q., La Jolla, Calif.
NOTES ON COURSE DECEPTION PRINCIPLES. Rept. no. 3-8 (Final) on Contract NObs-72039. Sep 59, 6p. AD-228 654.

DESCRIPTORS: *Aircraft, *Tracking, Errors, Countermeasures, Ships.

These notes were originated in support of efforts to avoid course deception effects in the painting of aircraft. They constitute a brief discussion of some of the principles employed in the design of the course-deception patterns and type-deception patterns formerly incorporated in the painting of surface ships as a defense against submarine and surface ship attack directed by visual sightings. Although technical developments have eliminated these measures from naval practice, the concepts from which they were developed are not without present value. The notes are reported herein primarily because no comparable written material on this subject appears to be available. (Author)

PB 154 565 $1.60

Naval Air Test Center, Patuxent River, Md.
EVALUATION OF TYPE C-1 RUNWAY MARKER LIGHT ASSEMBLY AND MOUNTING SUPPORTS FOR WATER AERODROME USE, by C. N. Cook. Rept. no. 1 (Final) on Proj. TED no. PTR AE 10022. 24 June 57, 19p. 3 refs. Serial ET311-141.

DESCRIPTORS: *Runway lights, *Markers, Mounting brackets, Tests, *Airports.

PB 155 911 $6.60

Radioplane, Van Nuys, Calif.
DEVELOPMENT OF A PAPERBOARD HONEYCOMB DECELERATOR FOR USE WITH LARGE PLATFORMS IN AERIAL DELIVERY SYSTEMS, by H. W. Bixby. Rept. on Contract AF 33(616)3779. May 59, 61p. 3 refs WADC Technical rept. 59-776; AD-240 234.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Air drop operations, *Paper, *Honeycomb cores, *Sandwich construction, Deceleration.

The paper honeycomb landing decelerator technique described represents a unique approach to provide an economical system for heavy drop aerial delivery of military cargo. This program has been concerned with the design and development of a landing device other than air bags to be employed with a family of stressed magnesium platforms, which in the aircraft entail side rail restraint and parachute extraction techniques. A survey and study of applicable methods and materials revealed that paper honeycomb, radially deployed, offered the most promise of achieving desired landing performance at lower cost. In tests conducted to produce a prototype landing system, the radial cell cushion showed promising deceleration characteristics. In controlled drop tests conducted at WADD with a 15 foot platform, 8,500 pounds gross load, and a platform oriented to impact in a longitudinal direction, the complete landing system gave acceptable deceleration and anti-toppling performance at a resultant (combined horizontal and vertical) impact velocity approaching 38 feet per second. Landing performance in the broadside direction was more critical than in the longitudinal direction. The arrested platform attitude of 10^{o} to 15^{o} side tip was such that the "drive-off" capability was impaired. (Author)

PB 154 051 $3.60

Visibility Lab., U. of California, San Diego.
A FEASIBILITY STUDY OF PHOTOELECTRIC ANTI-COLLISION SYSTEMS, by James L. Harris. Rept. on Contract NObs-72092. June 60, 32p. SIO Ref. 60-49; AD-247 536.

DESCRIPTORS: Aviation safety, *Aviation accidents, Flight paths, *Aircraft, Detection, Photoelectric cells, *Detectors, Optical systems, Colors, *Pulse discriminators, Light pulses.

Open-ended Terms: Anticollision systems

Information is presented as to the upper limits on performance capability of various visible spectrum anti-collision systems. It is hoped that this information can be a valuable aid in evaluating proposals for anticollision equipments which specify operation in the visible spectrum. It is believed, that a 24-hour a day pilot warning equipment could be designed and constructed.

The system would use passive contrast detection with color discrimination during day light hours and a modulated light source on board each plane at night (this might possibly utilize present anticollision lamps). Information other than detection and angular location could be obtained only during night-time operation. (Author)

Chemical Engineering

IS-273 $0.50

Ames Lab., Iowa State U. of Science and Tech.
A CONDENSER FOR THE VACUUM DISTILLATION OF METALS, by G. Burnet and W. Buchanan. Rept. on Contract W-7405-eng-82. Feb 61, 16p.

ANL-6287 $3.00

Argonne National Lab., Ill.
CHEMICAL ENGINEERING DIVISION. Summary rept. Oct-Dec 60, on Contract W-31-109-eng-38. Mar 61, 209p.

BMI-1511 $0.75

Battelle Memorial Inst., Columbus, Ohio.
A STUDY OF RADIATION-INDUCED CHANGES IN POLYMERS LEADING TO GRAFT COPOLYMERIZATION AS INFLUENCED BY STRUCTURAL FACTORS, by I. S. Ungar, J. F. Kircher and others. Topical rept. on Contract W-7405-eng-92. 3 Apr 61, 30p.

PB 171 261 $1.50

Ionics, Inc., Cambridge, Mass.
INVESTIGATION OF SUPERSATURATION IN SALINE WATER CONVERSION, by R. M. Lurie, M. E. Berg and A. Giuffrida. Rept. on Contract 14-01-001-180. Feb 61, 55p. 102 refs. OSW Research and Development Progress rept. no. 48.

DESCRIPTORS: *Sea water, *Desalination, *Electrodyalysis, Solutions, *Supersaturation, Calcium compounds, Sulfates, Solubility.

A commercial electrodialysis unit has been operated for 48 hours at 200 % $CaSO_4$ saturation using 25 ppm sodium hexametaphosphate (SHMP) and 25 ppm carboxymethyl cellulose. It is believed that it can be operated indefinitely under these conditions or with just 25 ppm of sodium hexametaphosphate. The feed simulated water from Webster, S. D. Supersaturated solutions cannot be handled in electrodialysis units without stabilizing additives. The supersaturated calcium sulfate solutions can be readily destabilized with alum or cellulosic flocculating agents, electrically or by heating. Various polyphosphates which are less expensive than SHMP can be used as satisfactorily. The variables of operation of an electrodialysis unit have been studied. Current density somewhat affects the allowable level of supersaturation, whereas flow rate and holdup are unimportant. Two widely different salt compositions acted alike at the same level of supersaturation. It may be possible to precipitate the salts in the electrodialysis unit in very finely divided form so that there will be no clogging of the flow paths.

MCW-1463 $2.25

Mallinckrodt Chemical Works, Weldon Spring, Mo.
PROCESS DEVELOPMENT. Quarterly progress rept. Oct-Dec 60, on Contract W-14-108-eng-8. 1 Feb 61, 99p.

IDO-14538 $0.50

Phillips Petroleum Co., Idaho Falls.
BARIUM FLUOZIRCONATE PRECIPITATION FROM HYDROFLUORIC ACID-ZIRCONIUM FUEL REPROCESSING SOLUTIONS. PART II. FISSION PRODUCT BEHAVIOR, by B. J. Newby. Rept. on Contract AT(10-1)-205. 8 Mar 61, 17p.

PB 154 576 $3.60

Rohm and Haas Co., Huntsville, Ala.
AN EVALUATION OF SAFETY DEVICES FOR LABORATORIES HANDLING EXPLOSIVE COMPOUNDS, by James P. Dodrill, Charles E. Green and others. Rept. on Research on Rocket Propellants and Rocket Motors, Contract DA 01-021-ORD-5135. Feb 61, 39p. 5 refs. Rept. S-28; AD-250 902.

DESCRIPTORS: *Safety devices, *Explosion damage, *Goggles, *Gloves, Containers, Explosives, Handling, Safety, Shielding, Design, Tests, Test equipment, *Protective coverings, Laboratory equipment, *Remote control systems, Transparent panels, Wood, Plastics, Glass, Metals.

Personal protective equipment
- Safety goggles
- Safety shields
  - Shield materials
  - Heavy duty shields (50 gm charge)
  - Medium duty shields (25 gm charge)
  - Swinging shields
- Gloves

Protective devices
- Sample transporting containers
- Remote manipulators (laboratory experiments)

PB 171 260 $0.75

Southern Research Inst., Birmingham, Ala.
INVESTIGATION OF CHELATION AS A MEANS OF REMOVING IONS FROM SEA WATER, by R. E. Lacey, E. W. Lang, and C. E. Feazel. Rept. on Contract 14-01-001-187. Mar 61, 22p. 9 refs. OSW Research and Development Progress rept. no. 42.

DESCRIPTORS: *Chelate compounds, Scale, *Sea water, *Desalination, Ions, Distilling plants.

The feasibility of using chelation to prevent the formation of scale in sea-water distillation processes by removing the scale-forming ions (calcium and magnesium) prior to distillation has been studied. Four general methods of operation appeared to be technically possible and were the basis for this feasibility study: (1) Using a water-soluble chelating agent to form insoluble precipitates with the scale-forming ions. (2) Using a water-soluble chelating agent to form solvent-extractable chelates. (3) Using a water-immiscible liquid chelating agent. (4) Using a water-insoluble solid chelating agent or resin.

Civil Engineering

PB 154 695 $1.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
DIESEL-POWERED HOSE REEL, by J. J. Traffalis. Interim rept. 12 May 60, 17p. Technical note N-371; AD-250 634L.

DESCRIPTORS: *Hose reels, *Tests, *Fuel hose, *Amphibious operations, Naval supplies, *Diesel engines, Fuels, Transportation.

A diesel-powered hose reel was developed for use with a 4-inch buoyant fuel system. The reel, powered by a 15 HP, 2 cyl, air-cooled, diesel engine, has a capacity of 3000 ft of 4-inch, collapsible, discharge hose. It can be mounted on, and efficiently operated from, either a warping tug or Landing Craft Utility (LCU). The installation tests consisted of seven installations of 1000 ft of 4-inch collapsible hose and two installations of 6-inch flat hose. It is recommended that the diesel-powered hose reel be assigned to the fleet operating forces for in-service testing. An improved unit with a capacity of 5000 ft of hose, capable of being mounted on and operated from an LCM-8 and suitable for use with either the 4-inch or 6-inch buoyant fuel systems is planned. (Author)

PB 154 702 $2.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
DREDGES FOR AMPHIBIOUS OPERATION, by A. L. Scott and O. P. Bak. Final rept. 28 Dec 59, 23p. 9 refs. Technical rept. R-054; AD-250 607.

DESCRIPTORS: *Amphibious operations, Sand, *Beaches, *Earth moving equipment, Blast, Landing craft, Effectiveness, Hydraulic systems.

Open-ended Terms: Dredges.

Landing operations are frequently hampered by offshore sand bars or coral reefs which block the movement of landing craft to the beach. This is a study of the feasibility of using a dredge, or other means, to cut access slots through the bars to the beach; and to cut slots in the beach as slips for the landing craft. Because of littoral currents, surf conditions, type of beach material, size of sand bars, and the large number of possible combinations of conditions due to these factors, the feasibility of opening slots through sand bars depends on the situation at the landing site at the time of the operation. A set of curves has been plotted which shows the amount of material that has to be removed per foot of slot at various depths for different craft, and the time necessary for various size dredges to accomplish this. Slots in the beach for landing slips were found to be impractical because the surf moves large volumes of material which rapidly refills the slots with sand. (Author)

PB 154 701 $1.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
THE MECHANICAL SUBGRADE. A PAVEMENT LOAD: TRANSMISSION TESTING DEVICE, by R. J. Lowe. 18 Oct 60, 12p. 10 refs. Technical note N-394; AD-250 648.

DESCRIPTORS: *Pavements, Test equipment, Pressure Deflection, Measurement.

A unique piece of pavement-testing equipment called the Mechanical Subgrade has been installed at NCEL and given load and calibration tests. The device was built by the FAA (formerly CAA) during the late 1940's to obtain basic information about flexible pavement design. In the device a test pavement is supported on a flooring of small steel plates mounted on plungers and calibrated springs so that when the test pavement is loaded, a yielding support, simulating a subgrade, is provided. The unit pressures transmitted by the loading system through the test specimen are recorded by deflection measuring bars. Calibration of the subgrade indicated that pavement deflections can be read to plus or minus 0.003 inch accuracy and that the springs available with the equipment have subgrade moduli of 22, 62, 87, 155, and 325 pci. (Author)

PB 154 693 $9.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
RUSTED COMPONENTS OF MATERIEL IN STORAGE, by J. C. King. Interim rept. 18 Oct 60, 114p. 10 refs. Technical note N-365; AD-250 628.

DESCRIPTORS: *Storage, *Warehouses, Boilers, Materials, Humidity, Vehicles, Coatings, Military equipment, Naval equipment.

NCEL is conducting a five-year storage test program to evaluate various storage environments and preservation levels for materiel under the Bureau of Yards and Docks' technical cognizance. Similar paired items were stored in different storage environments - an open air slab, a shed, a standard warehouse, a 50% RH warehouse, and a 40% RH warehouse. One of each pair had light domestic preservation treatment, and the other full contact preservation treatment. The storage protection of each environment is determined by periodic Class II inspections. Results of four years of storage show that protection is poor in the open air, fair in the shed, good in the standard warehouse, and better in the RH warehouses. Compared to domestic treatment, contact preservation decreases rust incidence about 58% for open air and 50% for shed and standard warehouse storage. After one more year of testing, all items will be completely disassembled for a final Class III inspection. (Author)

PB 154 333 $3.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
SNOW-COMPACTION EQUIPMENT, SNOW MIXERS, by R. C. Coffin, Jr. and E. H. Moser, Jr. 19 Jan 61, 33p. 12 refs. Technical rept. 108; AD-250 216.

DESCRIPTORS: Snow, Processing, Arctic regions, *Road building equipment, *Snow roads, Construction, *Runways.

Commercially available, towed-type construction mixers were modified as snow mixers for the Navy's cold-processing snow-compaction techniques. Two sizes of snow mixers, along with other special equipment, were necessary to produce good-quality compacted snow. One size, a Model 24 snow mixer, had a 24-inch-diameter rotor, a maximum rotor speed of

790 revolutions per minute, and a maximum peripheral speed of 4960 feet per minute. The other size, a Model 42 snow mixer, had a 42-inch-diameter rotor, a maximum rotor speed of 515 revolutions per minute, and a maximum peripheral speed of 5665 feet per minute. Both models satisfactorily mixed and blended snow for depth-processed, compacted-snow mats. They were also useful for processing new deep snowfall and heavy drift on compacted mats for maintaining the compacted surface. The Model 24 mixer can construct a mat up to 16 inches thick; the Model 42 mixer can construct a mat up to 28 inches thick. The mixers are effective at speeds of 150 feet per minute and a single unit can cover 1-1/4 acres per hour under favorable conditions. (Author)

PB 154 332 $3.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
SNOW-COMPACTION EQUIPMENT. SNOW ROLLERS, by J. B. Camm. 20 Jan 61, 34p. 12 refs. Technical rept. 107; AD-250 215.

DESCRIPTORS: *Runways, Tests, Effectiveness, *Snow roads, Construction, Trafficability, *Road building equipment.

An 8-foot-diameter, 8-foot-wide, 10,240-pound steel roller was developed to compressively compact the snow field before grading and depth-processing and to compact the pulverized snow after processing. This roller was also used to maintain compacted snow areas by progressively compacting new snowfall and drift. It was effective at speeds up to 500 feet per minute and could cover 4.9 acres per hour under good conditions. A 13-ton, standard construction roller with 13 pneumatic wheels was used in the final stage of construction to strengthen the top 6 inches of the compacted snow. This roller, along with the snow-compacting roller, was also useful in compressively compacting new snowfall. It was most effective on relatively hard snow where the tires penetrated less than a half inch into the surface, and it could cover up to 2.9 acres per hour under good conditions. (Author)

Electrical and Electronic Engineering

PB 154 559 $1.10

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
A METHOD OF DISTANCE MEASUREMENT BY USING COMMUNICATION EQUIPMENT, by E. C. Johnson. Technical note. 18 Nov 60, 10p. Rept. no. NADC-EL-N6087; AD-247 260.

DESCRIPTORS: *Communication equipment, *Radio communication systems, Radio equipment, *Transmitter receivers, *Range finding, Transistors, *Computers, Measurement, *Frequency shift keyers, Operation, Analysis.

A technique was developed which permits standard communication equipment to serve as a distance measuring equipment (DME). A small, lightweight, computer is added to any radio communication installation, which permits this equipment to perform the DME function in addition to the normal communication function. A new range reading is obtained on each single interrogation signal. Range accuracy is dependent upon the bandwidth of the communication equipment, and in typical military installations an accuracy of plus or minus 1/4 nautical mile is readily achieved. (Author)

PB 171 783 $1.00

Air Force Inst. of Tech., Wright-Patterson Air Force Base, Ohio.
RADIATION EFFECTS ON ELECTRONIC COMPONENTS: A COMPARISON OF PAPER CAPACITORS IMPREGNATED WITH VITAMIN "Q" MINERAL OIL AND BIS-(P-PHENOXYPHENYL) ETHER, by Milton E. L. Zellmer and Dennis R. Johnson. Rept. for Feb-June 60 on Materials Analysis and Evaluation Techniques. Nov 60, 39p. 16 refs. WADD Technical rept. 60-645.

DESCRIPTORS: *Paper capacitors, *Radiation effects, Ethers, Mineral oil.

Bis-(p-phenoxyphenyl) ether (BPPE) proves to be highly resistant to irradiation damage. Paper capacitors impregnated with BPPE and others impregnated with vitamin "Q" were irradiated for comparison. Tests with both failed. The paper itself was the major contributor of gassing and the subsequent cause of catastrophic breakdown and even rupture of the capacitor casings. Therefore, until some non-gassing dielectric material is found, BPPE although having itself a low rate of radiation, induced gassing will not solve the light weight, radiation resistant capacitor problem. (Author)

PB 154 517 $8.10

Airborne Instruments Lab., Deer Park, N. Y.
ANALYSIS OF A VOR DISTANCE COMPUTER, by A. Tatz and A. D. Mehall. Rept. on Task 22, Contract FAA/BRD-16. Mar 60, 82p. Rept. no. 5791-22.

DESCRIPTORS: *Analog computers, Statistical analysis, Errors, *Radio equipment, *Range finding, *Air traffic control systems, Tests, *Direction finding.

Open-ended Terms: VOR

Analog computer techniques are used to simulate an airborne equipment that will compute range from a VOR station while using the output of a single VOR receiver as the only available source of radio-navigation aid data. Starting from a known initial position, use is made of time derivatives of the bearing angle to the VOR station to compute a running value of distance derivative. The distance derivative is continuously integrated to yield constantly changing range

to the VOR station. The computer simulation outputs of recorded distance as well as recorded intermediate quantities are documented in this report. Statistical analyses of the errors in computed distance are presented and their significance is discussed with respect to the application of the single VOR distance computer to area navigation methods. (Author)

PB 153 959 $1.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE DOPLOC RECEIVER FOR USE WITH THE CIRCULATING MEMORY FILTER, by Kenneth H. Patterson. Rept. no. 18 on ARPA Satellite Fence Series: Aug 60, 13p. 4 refs. BRL Technical note no. 1345; AD-249 598.

DESCRIPTORS: *Guided missile tracking systems, *Radio receivers, Design, *Doppler tracking, Radio-frequency filters, Frequency converters, Delay lines, Memory devices, Satellite vehicles.

Open-ended Terms: Doploc.

A new receiver concept was evolved for use in the Doploc system of spatial surveillance. Intended for use with the circulating memory filter, the performance specifications are both unique and stringent. Although detailed circuitry was designed, a curtailment of the program prevented the development of a laboratory model. Because of this, only the basic techniques are presented. (Author)

PB 171 295 $3.00

Bolt, Beranek and Newman, Inc., Cambridge, Mass.
THE RESPONSE OF ELECTRONICS TO INTENSE SOUND FIELDS, by Denis U. Noiseux, Norman Doelling and others. Rept. for 1 Mar 59-June 60 on Contract AF 33(616)6347. Jan 61, 193p. 22 refs. WADC Technical rept. TR-60-754.

DESCRIPTORS: *Electronic equipment, Acoustics, Vibration, Tests, Sound, Intensity.

The intense sound fields present in missiles and other flight vehicles may cause serious malfunction of electronic equipment. The malfunction manifests itself in an unwanted output from some electronic component, in a mechanical failure of an electronic component, or in a mechanical failure of some part of the supporting structure for an electronic component. The purpose of this contract is to determine the possible ways in which intense sound can excite electronic equipment, to localize the probable areas of failure or malfunction, and to propose testing procedures. Three distinct but related problems were studied. First, small electronic components were exposed to intense sound and to vibration and their response to each form of excitation was investigated. Second, simplified models of the supporting structures for the components were made and their behavior in intense sound fields was studied. Third, some types of the electronic components were mounted on structures and exposed to intense sound. The electrical noise output from small electronic components caused directly by sound pressure levels of 150 db (re 2 x 10^{-4} dynes/cm^2) was generally less than that caused by mechanical vibration of the component at acceleration levels of one g. (Author)

PB 171 719 $0.50

Bureau of Naval Weapons, Washington, D. C.
AC VOLTAGE, 0.0001 TO 1000 VOLTS VARIABLE FREQUENCY. BuWeps-BuShips Calibration Program. 22 Sep 58, 33p. Secondary Standards Lab., Measurement System Operation Procedure BE-04.

DESCRIPTORS: *Voltmeters, *Calibration, Alternating current, Instruction manuals, *Instrumentation.

This procedure normally applies to the calibration of Test Instruments with accuracies between 0.25% and 0.75% of full scale. Test Instruments of lesser accuracy than 0.75% of full scale should be calibrated by a less accurate system than that described.

PB 171 720 $0.50

Bureau of Naval Weapons, Washington, D. C.
AC CURRENT, 0.075 TO 100 AMPERES 60 CPS. BuWeps-BuShips Calibration Program. 18 Sep 58, 25p. Secondary Standards Lab. Measurement System Operation Procedure BI-01.

DESCRIPTORS: *Ammeters, *Calibration, *Alternating current, Instruction manuals, *Instrumentation, Measurement.

This procedure normally applies to the calibration of Test Instruments with accuracies between 0.25% and 2.0% of full scale. Test Instruments of lesser accuracy than 2.0% of full scale should be calibrated by a less accurate system if such is available. The wide range of measurements covered by this procedure has been divided into separate phases. Each phase is discussed separately.

PB 171 695 $0.50

Bureau of Naval Weapons, Washington, D. C.
AMPLIFIER HEWLETT PACKARD 450A. BuWeps-BuShips Calibration Program. 29 Nov 60, 16p. Secondary Standards Labs. Instrument Calibration Procedure AA-20.

DESCRIPTORS: *Amplifiers, *Calibration, Instrumentation.

The Test Instrument is a highly stable general purpose amplifier. It has both a 20 db and a 40 db gain, with a maximum output of 10 volts over a broad range of frequencies. Internal noise level is measured with a VTVM, with the Test Instrument set for 40 db gain and its input terminals shorted. Gain, stability, and frequency response are determined by measuring the input and output voltages over a wide frequency range. Stability is determined by varying the line voltage and

determining if the gain remains within prescribed limitations. Distortion is determined by injecting pure signals and measuring the resultant distortion of the output signal.

PB 171 729 $0.50

Bureau of Naval Weapons, Washington, D. C.
BATTERY PACK. BuWeps-BuShips Calibration Program. 24 July 59, 8p. [Secondary Standards Lab.] Technical Manual TDO D-5.

DESCRIPTORS: *Dry cells, *Packs, Electrical networks, Power supplies, Direct current, Sources, *Calibration.

Open-ended Terms: Battery pack.

The TDO D-5 Battery Pack has been designed to provide a convenient source of direct current to be used with DC bridge networks, or wherever a fixed low-voltage supply is required.

PB 171 731 $0.50

Bureau of Naval Weapons, Washington, D. C.
COAXIAL VOLTAGE DIVIDER. BuWeps-BuShips Calibration Program. 15 Oct 59, 16p. [Secondary Standards Lab.] Fabrication Instructions TDO D-22.

DESCRIPTORS: *Voltage dividers, *Calibration, Instrumentation, Design.

These instructions are necessary to supplement and calibrate the instrument described in the enclosed engineering drawings.

PB 171 700 $0.50

Bureau of Naval Weapons, Washington, D. C.
COMBINED HETERODYNE FREQ. METER AND CRYSTAL CONTROLLED CALIBRATOR MODEL LR. BuWeps-BuShips Calibration Program. 26 Jan 61, 30p. Secondary Standards Lab. Instrument Calibration Procedure AF-23.

DESCRIPTORS: *Frequency meters, *Crystal oscillators, *Calibration, Instrumentation.

Accuracies are verified as follows: the power supply output voltages by direct measurement with voltmeters of suitable accuracy; the crystal oscillator frequency by comparison with the electronic counter; the multivibrator range frequencies by measurement with the electronic counter; the heterodyne frequency meter by comparison with the crystal oscillator at specified harmonic check points on each range; the frequency interpolator meter scale by comparison with the difference frequency between the heterodyne frequency meter and an external oscillator monitored by the electronic counter. The correction function between the heterodyne frequency meter and the crystal oscillator-multivibrator is verified by checking the Compensator control adjustment at a specified frequency check point on each range of the heterodyne frequency meter. The accuracy of the 5.5 filter cut-off frequency and roll-off characteristics are verified in order to assure the correct operation of the interpolator electronic voltmeter.

PB 171 707 $0.50

Bureau of Naval Weapons, Washington, D. C.
DC CURRENT INSTRUMENTS 0.00001 TO 1.0 AMPERE FULL SCALE. BuWeps-BuShips Calibration Program. 21 Oct 58, 22p. Secondary Standards Lab. Instrument Calibration Procedure AI-01.

DESCRIPTORS: *Ammeters, *Calibration, *Instrumentation.

This procedure normally applies to the calibration of instruments with full scale ranges from 0.00001 to 1.0 ampere, and with full scale accuracies between 0.2% and 0.75%. Instruments of lesser accuracy than 0.75% full scale should be calibrated by a less accurate system than that utilized herein, if such is available.

PB 171 694 $0.50

Bureau of Naval Weapons, Washington, D. C.
DECADE AMPLIFIERS BALLANTINE 220B AND 220C. BuWeps-BuShips Calibration Program. 16 Apr 60. 19p. Secondary Standards Labs. Instrument Calibration Procedure AA-18.

DESCRIPTORS: *Amplifiers, *Calibration, Instrumentation.

Open-ended Terms: Decade amplifiers.

Linearity is tested by attenuating the input signal with a standard ratio transformer and determining that the amplifier output voltage as indicated by a standard electronic voltmeter is decreased in the same ratio as the input signal. Frequency response is calibrated with the gain switch in the X10 position by monitoring the input signal at a constant level with a standard voltmeter and comparing the output voltage at each calibration frequency with the reference level established at 10 cps. Distortion is measured by injecting a signal through a series resistor and shunting the amplifier input with an adjustable filter to minimize the distortion in the signal. The percentage of distortion in the amplifier output signal at frequencies of 40 cps, 1 kcps, 10 kcps and 20 kcps is measured with a distortion analyzer.

PB 171 697 $0.50

Bureau of Naval Weapons, Washington, D. C.
ELECTRONIC MULTIMETERS ME-6A/U, ME-6B/U, ME-6C/U, AND ME-74/U. BuWeps-BuShips Calibration Program. 23 June 60, 23p. Secondary Standards Lab. Instrument Calibration Procedure AE-15.

DESCRIPTORS: *Multimeters, *Calibration, Instrumentation.

An accurate voltage derived from the AC Power Supply is fed through a Decade Voltage Divider to the Test Instrument. The AC Power Supply output indication and the Decade Voltage Divider switch settings determine the input voltage to the Test Instrument.

PB 171 730 $0.50

Bureau of Naval Weapons, Washington, D. C.
FILTER, LOW PASS. BuWeps-BuShips Calibration Program. 24 July 59, 8p. [Secondary Standards Lab.] Fabrication Instructions TDO D-13.

DESCRIPTORS: *Low pass filters, *Calibration, Instrumentation, Design.

PB 171 699 $0.50

Bureau of Naval Weapons, Washington, D. C.
FREQUENCY CONVERTER HEWLETT PACKARD 525A OR MX-1637/U (AN/USM-26). BuWeps-BuShips Calibration Program. 14 Oct 60, 14p. Secondary Standards Lab. Instrument Calibration Procedure AF-07 (Rev. 1) Supersedes ICP: 7276.

DESCRIPTORS: *Frequency converters, *Calibration, Instruction manuals, *Instrumentation, Measurement

Open-ended Terms: AN/USM-26

The Test Instrument sensitivity and 10.1 Mc trap are tested with a signal generator and an electronic counter.

PB 171 701 $0.50

Bureau of Naval Weapons, Washington, D. C.
GENERATOR, SIGNAL MEASUREMENTS CORP. MODEL 80 TS-497A/URR, TS-497B/URR AND 497C/URR. BuWeps-BuShips Calibration Program. 1 Mar 60, rev. 9 Feb 61. 29p. Secondary Standards Lab. Instrument Calibration Procedure AG-31.

DESCRIPTORS: Instrumentation, *Calibration, *Signal generators, Tests.

The Test Instrument is a general purpose signal generator which provides a continuously variable cw or modulated output from 0.1 to 100,000 microvolts in the frequency range from 2 to 400 Mc. Power supply regulation is tested by establishing a power output reference level, and measuring any variation in this value as the line voltage is varied from 105 to 125 volts. Frequency response is evaluated by establishing a power output reference level, and measuring the variation at several frequencies throughout the range of the Test Instrument. External modulation characteristics are tested by applying an external DC modulating voltage equivalent to the minimum peak pulse voltage required to produce the specified RF output power. Output attenuator linearity is tested by applying internal 1000 cps sine wave modulation and detecting the output with a square law crystal. Frequency dial and modulation frequency are tested by measurment with the electronic counter with suitable frequency converters installed. The modulation meter is calibrated by comparing its indications (percent modulation) with percent modulation values computed from the oscilloscope display of the detected 1000 cps AF voltage.

PB 171 706 $0.50

Bureau of Naval Weapons, Washington, D. C.
GENERATOR, TIME MARK TEKTRONIX 180A. BuWeps-BuShips Calibration Program. 9 Nov 60, 17p. Secondary Standards Lab. Instrument Calibration Procedure AG-58.

DESCRIPTORS: *Generators, *Calibration, Instrumentation.

Open-ended Terms: Time Mark Tektronix.

The Test Instrument consists of a precision 1 mc crystal oscillator, plus frequency dividing and multiplying systems. The Test Instrument crystal frequency and stability are tested with an electronic counter. The frequencies of the sine wave signals are measured in a similar manner. The trigger pulses are displayed on the oscilloscope to measure their amplitude. The marker pulses are displayed on an oscilloscope, which permits the measurement of pulse amplitude relationships, as well as proper pulse spacing (frequency). Correct amplitude of the sine wave signals is verified by using a VTVM.

PB 171 721 $0.50

Bureau of Naval Weapons, Washington, D. C.
INDUCTANCE, 1.0μH TO 100H DIRECT METHOD (USING GR 1632-A BRIDGE). BuWeps-BuShips Calibration Program. 7 Nov 60, 13p. Secondary Standards Lab. Measurement System Operation Procedure BL-04.

DESCRIPTORS: *Inductance, *Coils, *Calibration, Electric bridges, Instruction manuals, Measurement, *Instrumentation.

The basic technique used in this system is the utilization of the inductance bridge to measure directly the value of the Test Instrument. This system is not suitable for the calibration of inductors with magnetic cores, since no provision is made for the determination of the incremental inductance due to current in the winding. Normally, the calibrations are performed at frequencies of 100 cps or 1000 cps. The bridge can be used at frequencies from 60 cps to 10 kc with some decrease in accuracy.

PB 171 713 $0.50

Bureau of Naval Weapons, Washington, D. C.
MICROWAVE POWER METER HEWLETT PACKARD 430C AND 430B-95B (MODIFIED). BuWeps-BuShips Calibration Program. 28 Oct 60, 21p. Secondary Standards Lab. Calibration Procedure GP-02 (Rev. 1), Supersedes ICP: 8901, 28 Oct 58.

DESCRIPTORS: *Power meters, *Microwave equipment, Instrumentation, *Calibration, Tests.

The overall performance test is accomplished by adjusting the Test Instrument D.C. Bias controls to obtain zero and full-scale meter indications and measuring the resultant audio voltage across an externally connected thermistor mount. Allowable tolerances for these voltages are based on a 5% maximum error for full and half-scale indications.

PB 171 714 $0.50

Bureau of Naval Weapons, Washington, D. C.
MICROWAVE POWER METER, TRANSISTOR POLARAD MODEL P-3. BuWeps-BuShips Calibration Program. 1 Mar 61, 11p. Secondary Standards Lab. Instrument Calibration Procedure GP-04.

DESCRIPTORS: *Power meters, *Calibration, Instrumentation, Microwave equipment.

The Test Instrument is a self-balancing a.f. substitution power bridge. A thermistor is used as the active arm and a voltmeter calibrated in terms of power is used to measure the a.f. substituted power. The voltmeter circuitry is tested by adjusting the Test Instrument bias controls (zeroing adjustments) to obtain zero and full-scale meter indications and measuring the resultant audio voltage across an externally connected thermistor mount. Allowable tolerances for these voltages are 2.5%. The operating resistance of the Test Instrument bridge circuit is determined by adjusting a decade resistor, connected across the Test Instrument input, and noting the value of resistance required to cause oscillation to start or stop. The voltmeter adjustment section is used to accurately set the voltmeter zero and full-scale indications in the event that the Test Instrument fails to pass the calibration verification test.

PB 171 715 $0.50

Bureau of Naval Weapons, Washington, D. C.
POWER METER TS-125/AP. BuWeps-BuShips Calibration Program. 16 Dec 60, 13p. Secondary Standards Lab. Instrument Calibration Procedure GP-05.

DESCRIPTORS: *Power meters, *Calibration, Instrumentation.

The Test Instrument is a portable, battery-operated power meter designed to operate in the frequency range of 2400 to 3335 Mc. The batteries are assumed to be in satisfactory condition if the bridge can be balanced with some latitude at the balance point. The attenuation of the two attenuators and the cable is measured by an audio substitution method using the Weinschel CF-1 a.f. substitution attenuator, IN-1 audio level indicator and the BA-1 bolometer preamplifier. The panel meter is calibrated by comparing its indications with those of a Polarad P-3 or an HP430C power meter.

PB 171 693 $0.50

Bureau of Naval Weapons, Washington, D. C.
PREAMPLIFIER: FAST RISE TEKTRONIX 53/54K. BuWeps-BuShips Calibration Program. 18 Dec 59, rev. 1 June 60. 30p. Secondary Standards Lab. Instrument Calibration Procedure AA-17.

DESCRIPTORS: *Preamplifiers, *Calibration, Instrumentation.

Open-ended Terms: Tektronix.

Preliminary frequency response adjustments are made by injecting a square wave signal into the preamplifier and displaying the output signal on an oscilloscope. The preamplifier is adjusted so that the square wave has a horizontal top and a minimum of rounding or peaking of the leading edge corner. The attenuator is calibrated by comparing its settings with the settings of an external standard voltage divider required to maintain a reference level on the oscilloscope display. Frequency response is calibrated by monitoring the input signal voltage at a constant level while increasing its frequency. The vertical deflection of the oscilloscope trace is measured at the calibration frequency and compared to the deflection at a reference frequency.

PB 171 692 $0.50

Bureau of Naval Weapons, Washington, D. C.
PREAMPLIFIER, WIDE BAND TEKTRONIX 53/54A. BuWeps-BuShips Calibration Program. 18 Dec 59, 30p. Secondary Standards Lab. Instrument Calibration Procedure AA-15.

DESCRIPTORS: *Preamplifiers, *Calibration, Instrumentation.

Open-ended Terms: Tektronix.

The Test Instrument is a plug-in, wide-band, DC preamplifier used with Tektronix 530- and 540-series oscilloscopes. Preliminary frequency response adjustments are made by displaying the square-wave output on an oscilloscope and adjusting the preamplifier for a display with a horizontal top and minimum of rounding or peaking at the leading edge corner. The attenuator is calibrated by comparing its settings with the settings of an external standard voltage divider required to maintain a reference level on the oscilloscope display. The frequency response is calibrated by monitoring the input signal at a constant level while increasing its frequency. The vertical deflection of the oscilloscope trace is measured at each calibration frequency and compared with the deflection at a reference frequency.

PB 171 708 $0.50

Bureau of Naval Weapons, Washington, D. C.
RADIO FREQUENCY WATTMETER AN/URM-43A AND AN/URM-43B. BuWeps-BuShips Calibration Program. 22 Aug 60, 16p. Secondary Standards Lab. Instrument Calibration Procedure AP-01.

DESCRIPTORS: *Radiofrequency, *Wattmeters, *Calibration, *Instrumentation.

Open-ended Terms: AN/URM-43A, AN/URM-43B.

The Test Instrument is initially inspected for mechanical damage and coolant leakage. The dc resistance of the load is then accurately measured with the Resistance Measuring Facility, and VSWR measurements are performed at 300, 450, and 600 Mc. Since a signal source of sufficient power output at the calibration frequency is

not available, the required calibration voltages are supplied by a variable 60 cycle ac voltage source whose output is monitored by an accurate AC Voltmeter. The Test Instrument wattmeter scales are calibrated at several points on the dial and required adjustments made. The ac voltage required for a given wattmeter indication is determined from the voltage graph supplied and is dependent upon the value of load resistance previously measured.

PB 171 704 $0.50

Bureau of Naval Weapons, Washington, D. C.
RF SOURCES WEINSCHEL ENGINEERING MS-8, MS-12, MS-13. BuWeps-BuShips Calibration Program. 18 Jan 61, 29p. Secondary Standards Lab. Instrument Calibration Procedure AG-53.

DESCRIPTORS: *Radiofrequency, Sources, *Calibration, *Instrumentation, Tests.

The Test Instruments are RF signal sources capable of operating cw or square-wave modulated in the following frequency ranges: 900 to 2200 Mc (MS-8), 50 to 250 Mc (MS-12), and 250 to 920 Mc (MS-13). The characteristics of the modulated RF signal are determined over the entire frequency range by observing the modulated RF signal on an oscilloscope. The accuracy of the frequency dial calibration and the frequency stability are determined with an electronic counter and transfer oscillator. The power output measurements are made with a calibrated attenuator, thermistor mount, and power meter.

PB 171 696 $0.50

Bureau of Naval Weapons, Washington, D. C.
SENSITIVE ELECTRONIC VOLTMETER BALLANTINE 300D. BuWeps-BuShips Calibration Program. 9 May 60, 26p. Secondary Standards Lab. Instrument Calibration Procedure AE-14.

DESCRIPTORS: *Voltmeters, *Calibration, Instrumentation.

A voltage source consisting of a low-frequency oscillator and a voltage control unit is monitored with a standard voltmeter. The output is connected through a voltage dividing system to supply precise calibrating voltages. Regulation is tested by maintaining the input voltage at a constant level and comparing the meter indications at high and low line voltages with the indication at normal line voltages. Sensitivity and zero suppression tests are made by measuring the input voltage required to deflect the meter to fullscale on the 0.1 volt range and to the equivalent indicated value on the next higher range. Linearity and accuracy tests are made by measuring the input voltage required to deflect the meter to each selected calibration point. Frequency response is tested after substituting a variable-frequency source monitored with a coaxial thermal voltmeter and precision potentiometer.

PB 171 702 $0.50

Bureau of Naval Weapons, Washington, D. C.
SIGNAL GENERATOR GENERAL RADIO 1001A. BuWeps-BuShips Calibration Program. 6 July 60, 36p. Secondary Standards Lab. Instrument Calibration Procedure AG-41.

DESCRIPTORS: *Signal generators, Instrumentation, *Calibration, Tests, *Oscillators, *Voltage regulators, Radio equipment.

The "Line Regulation Test" checks the Test Instrument voltage regulator functionally by recording the output frequency and amplitude as the ac input is varied from 105 to 125 volts. The calibration of the frequency dial is verified at three points on each range, using the Electronic Counter as the standard. A frequency response test is performed in conjunction with the frequency test to verify the correct output amplitude over the frequency range of the Test Instrument. The Test Instrument internal 400 cps oscillator is tested using a Crystal Detector and Wave Analyzer. The Electronic Counter is employed to measure the frequency of the 400 cps oscillator. The envelope distortion is measured with the Wave Analyzer. The Test Instrument "Modulator Test" is accomplished with an Oscilloscope. AC calibration of the attenuator is accomplished using the Wave Analyzer as a tuned voltmeter.

PB 171 705 $0.50

Bureau of Naval Weapons, Washington, D. C.
SIGNAL GENERATOR GENERAL RADIO 1001A (USING L&N RESISTANCE MEASURING FACILITY). BuWeps-BuShips Calibration Program. 22 Aug 60, 35p. Secondary Standards Lab. Instrument Calibration Procedure AG-54.

DESCRIPTORS: *Signal generators, *Calibration, Tests, Instrumentation, *Voltage regulators, Oscillators, Radio equipment.

The voltage regulator is tested functionally by recording the output frequency and amplitude as the ac input is varied from 105 to 125 volts. The calibration of the frequency dial is verified at three points on each range, using the electronic counter as the standard. A frequency response test is performed in conjunction with the frequency test to verify the correct output amplitude over the frequency range of the Test Instrument. The internal 400 cps oscillator is tested using a crystal detector and wave analyzer. The electronic counter is employed to measure the frequency of the 400 cps oscillator. The envelope distortion is measured with the wave analyzer. The Test Instrument Modulator Test is accomplished with an oscilloscope. The Test Instrument percent modulation is measured by displaying the modulated wave on the oscilloscope and making computations.

PB 171 703 $0.50

Bureau of Naval Weapons, Washington, D. C.
SIGNAL GENERATOR TS-535/U AND TS-535A/U. BuWeps-BuShips Calibration Program. 9 Oct 60, 24p. Secondary Standards Lab. Instrument Calibration Procedure AG-50.

DESCRIPTORS: *Instrumentation, *Calibration, *Signal generators, Tests.

Power Supply regulation is tested by monitoring the output frequency and amplitude, while the line voltage is varied from 105 to 125 volts. The Test Instrument output frequency and amplitude are measured at eleven points after adjusting to a specified condition (7.00 kc and 10 μv). Distortion is measured using the distortion analyzer. Hum is measured using the wave analyzer. The wave analyzer is tuned to 120 cps, the total amount of hum voltage is then indicated on the wave analyzer panel meter. The wave analyzer is used as a sensitive tuned voltmeter to measure the voltage at five settings of the Multiplier switch (step attenuator). Output amplitude is measured at three settings of the Microvolts control (rf attenuator). Correct operation of the modulation circuitry is verified by observing the modulated signal on the oscilloscope. Percent modulation is computed by measuring the peaks and troughs of the modulated envelope.

PB 171 727 $0.50

Bureau of Naval Weapons, Washington, D. C.
STANDARD CAPACITORS 100 pF TO 1.0 uF GENERAL RADIO 509, 1409, 1401 SERIES. BuWeps-BuShips Calibration Program. 14 Sep 60, 20p. Secondary Standards Cross-Check Procedure CC-01, (Rev. 1) Supersedes CCP: 1250, 24 July 59.

DESCRIPTORS: *Capacitors, *Instrumentation, *Calibration.

The basic cross-check method utilized in this procedure is the comparison of the two Test Instruments by using the precision capacitor to determine the difference between the Test Instruments.

PB 171 728 $0.50

Bureau of Naval Weapons, Washington, D. C.
STANDARD RESISTORS NBS TYPE 1 OHM TO 100,000 OHMS. BuWeps-BuShips Calibration Program. 25 Feb 60, 15p. Secondary Standards Lab. Cross-Check Procedure CR-01.

DESCRIPTORS: *Fixed resistors, *Calibration, Instrumentation.

This procedure utilizes the direct reading ratio set to measure the difference between two standard fixed resistors of the same nominal value. This test is performed by connecting the two fixed resistors and the direct reading ratio set to form a Wheatstone bridge.

PB 171 716 $0.50

Bureau of Naval Weapons, Washington, D. C.
TEST SET, RADAR TS-147B/UP AND TS-147D/UP. BuWeps-BuShips Calibration Program. 22 Dec 60, 23p. Secondary Standards Lab. Instrument Calibration Procedure GQ-03.

DESCRIPTORS: *Radar equipment, *Test sets, *Microwave equipment, *Calibration, Instruction manuals, Instrumentation.

Open-ended Terms: TS-147B/UP, TS-147D/UP.

The instrument is tested functionally to ascertain satisfactory performance and proper functioning of all controls. The frequency dial calibration is accomplished by using the Test Instrument as a signal generator. Square-wave modulation is employed to simplify the adjustment of the Test Instrument klystron to the calibration frequencies. The output frequency is measured on the electronic counter and associated transfer oscillator, and compared to the Frequency dial indications. The Test Instrument voltage regulation circuitry is tested by monitoring the RF output frequency change when the line voltage input is changed from 105 to 125 volts ac. Accuracy of the attenuator dial and step attenuator is verified by an RF substitution technique. The power input is tested at the +10 dbm level by applying 10 mw to the Test Instrument and then measuring the corresponding Test Instrument power indication.

PB 171 712 $0.50

Bureau of Naval Weapons, Washington, D. C.
TEST SET, WAVEMETER TS-117/GP. BuWeps-BuShips Calibration Program. 29 Dec 60, 15p. Secondary Standards Lab. Calibration Procedure GF-13.

DESCRIPTORS: *Test sets, *Wavemeters, *Instrumentation, *Calibration.

Open-ended Terms: TS-117/GP

The Test Instrument is a resonant-cavity unit which may be used as an absorption or transmission type wavemeter in the frequency range of 2400 to 3400 Mc. A crystal detector in the Test Instrument is used to rectify the RF signal and the resultant current is applied through a sensitivity control to a dc microammeter. The input sensitivity of the crystal is tested by applying a known RF power level to each input and verifying that a full-scale meter indication is produced over the entire frequency range with the RF amplitude maintained at the fixed level.

PB 171 709 $0.50

Bureau of Naval Weapons, Washington, D. C.
TRANSFER OSCILLATOR HEWLETT PACKARD 540A OR 540B. BuWeps-BuShips Calibration Program. 16 Dec 60, 31p. Secondary Standards Lab. Instrument Calibration Procedure AQ-02 (Rev. 1) Supersedes ICP 8554-A, 23 Dec 59.

DESCRIPTORS: *Oscillators, *Instrumentation, *Calibration, Tests.

The fundamental frequency and output voltage of the Test Instrument oscillator is calibrated at several points across its range using an electronic counter with its associated frequency converter unit, and a VTVM. Oscillator stability is tested by performing a series of output frequency measurements within a discrete time interval. The Test Instrument video amplifier and its oscilloscope vertical and horizontal amplifiers are each tested for input sensitivity and frequency response, using a test oscillator and VTVM. The input

attenuator (HP 540A only) is functionally tested by initially measuring its terminal dc resistance. The low frequency mixer sensitivity is measured by determining the RF input level required at 1000 Mc to provide a video output of 6 db above the noise level. The high frequency mixer is similarly tested at 10 KMc. The HP 540B Test Instruments include a harmonic generator which is functionally tested by connecting its input to the oscillator output and measuring the resultant harmonic generator output.

PB 171 732 $0.50

Bureau of Naval Weapons, Washington, D. C.
TYPE N CONNECTOR GAGE. BuWeps-BuShips Calibration Program. 19 Oct 60, 22p. [Secondary Standards Lab.] Fabrication Instructions TDO D-34.

DESCRIPTORS: *Gages, *Electric connectors, *Calibration, Instrumentation.

The Type N Connector Gage was designed to provide a means for measuring the critical dimensions of UG-21( )/U, UG-22( )/U, and UG-23( )/U connectors used in precision coaxial components such as attenuators, directional couplers, and slotted lines. Conformance to applicable tolerances aids in reducing discontinuities and resultant VSWR presented by the connector and prevents damage to mating connectors.

PB 171 710 $0.50

Bureau of Naval Weapons, Washington, D. C.
VACUUM TUBE MEGOHMMETER CALN-60089, CALN-60089-A, CALN-60089-B, AND WESTON 799. BuWeps-BuShips Calibration Program. 23 June 60, 10p. Secondary Standards Lab. Instrument Calibration Procedure AR-07.

DESCRIPTORS: *Instrumentation, *Calibration, *Ohmmeters, Electron tubes.

The linearity of the Test Instrument is checked by connecting a megohm decade box and a 10,000 megohm resistor to the Test Instrument input terminals, and recording the Test Instrument indications at predetermined cardinal points. The line end of the 10,000 megohm resistor is shielded to reduce stray voltage pickup.

PB 171 698 $0.50

Bureau of Naval Weapons, Washington, D. C.
VACUUM TUBE VOLTMETERS HEWLETT PACKARD 400D, 400H, AND 400L (USING THE RFL 1605). BuWeps-BuShips Calibration Program. 5 July 60, 48p. Secondary Standards Lab. Instrument Calibration Procedure AE-16.

DESCRIPTORS: *Voltmeters, *Calibration, Electron tubes, Instruction manuals, *Instrumentation.

The accuracy of the voltage indication is verified at 400 cps by applying known voltages to the Test Instrument and recording the corresponding meter indications. The voltage is applied from the Wide Range Oscillator (accurately established by using the Calibration/Transfer Standard) and controlled by means of a Voltage Divider. Frequency response is measured by using the TDO D-8 Coaxial Thermal Voltmeters.

PB 171 722 $0.50

Bureau of Naval Weapons, Washington, D. C.
VOLTAGE STANDING WAVE RATIO 3/8" COAXIAL, TYPE N CONNECTOR (500 TO 4000 MC). BuWeps-BuShips Calibration Program. 21 Nov 60, 18p. Secondary Standards Lab. Measurement System Operation Procedure HV-07.

DESCRIPTORS: *Voltage, *Standing wave ratios, Measurement, Signal generators, Radiofrequency attenuators, Coaxial filters, Waveguide couplers, *Calibration, Electric connectors, Instruction manuals, *Instrumentation.

This procedure describes the operation of a standards laboratory calibration system which is used to measure the voltage standing wave ratio of 3/8 inch coaxial instruments having type N connectors, and in the frequency range from 500 Mc to 4000 Mc. Single-ended instruments such as signal generators and terminations or double-ended instruments such as attenuators, directional couplers, or filters having a VSWR up to 10:1 can be calibrated with this system.

PB 171 711 $0.50

Bureau of Naval Weapons, Washington, D. C.
WAVE ANALYZER HEWLETT PACKARD 302A. BuWeps-BuShips Calibration Program. 21 Nov 60, 30p. Secondary Standards Lab. Instrument Calibration Procedure AW-14.

DESCRIPTORS: *Harmonic analyzers, Tests, *Calibration, *Instrumentation.

The Test Instrument is a tuned electronic voltmeter which has a range of 20 cps to 50 kc, and includes a meter, an amplifier, filters, a bridge oscillator, a beat frequency oscillator, and a regulated power supply. The Frequency dial accuracy is tested by using the internal beat frequency oscillator and measuring the output frequency with an electronic counter. The amplitude and frequency response of the beat frequency oscillator is tested with an accurate VTVM. The voltmeter accuracy is tested with an accurate VTVM and a decade voltage divider. The voltmeter frequency response is tested by using the internal beat frequency oscillator as a signal source, and using the VTVM as the calibrating standard. The frequency rejection (bandwidth) and automatic frequency control (AFC) are tested with an oscillator, an electronic counter, and the Test Instrument voltmeter. Frequency rejection is determined by changing the oscillator frequency and measuring the amount of rejection on the voltmeter. AFC is tested by slowly changing the oscillator frequency and verifying that the Test Instrument will automatically track the changing frequency.

PB 154 472 $7.60

David Sarnoff Research Center, Princeton, N. J. INVESTIGATION OF HIGH-TEMPERATURE PHOTOVOLTAIC SOLAR ENERGY CONVERTER, by J. J. Wysocki, J. J. Loferski, and P. Rappaport. Triannual progress rept. no. 1, 15 July-15 Nov 58, on Contract DA 36-039-sc-78184. 15 Dec 58, 74p. 22 refs.

DESCRIPTORS: *Photoelectric cells, Solar energy, Temperature, Tests.

(1) A theoretical analysis of the photovoltaic effect at increasing temperatures indicates an increase in band gap for the optimum semiconductor material. At 150°C gallium arsenide is close to the optimum material and should be twice as efficient as silicon solar cells. The nature of the dark current characteristic of the p-n junction is important to the high-temperature performance of solar energy converters. Three different cases are treated in the present analysis. (2) Gallium arsenide was chosen as the material for experimental fabrication of cells. At present cells in the 5% efficiency range are being made in areas a few tenths of cm^2. Improvement can be expected. Temperature measurements on such cells indicate that they conform to the theory for the worst case of the dark current characteristic. Silicon cells fit the intermediate case in the theory very well. Cadmium sulfide cells behave like the worst case silicon cell in the theory and definitely not like a 2.4 ev gap semiconductor should. (3) Spectral measurements on silicon solar cells can give information on the depth of junction and minority carrier diffusion length. (4) Variable bandgap photovoltaic solar cells have been analyzed. In practical solar cells it may be possible to increase the efficiency by 50% over existing values by simple structures. Much larger increases in efficiency do not seem likely. (Author)

PB 154 473 $4.60

David Sarnoff Research Center, Princeton, N. J. INVESTIGATION OF HIGH-TEMPERATURE PHOTOVOLTAIC SOLAR ENERGY CONVERTER, by J. J. Wysocki, J. J. Loferski, and P. Rappaport. Triannual progress rept. no. 2, 15 Nov 58-15 Mar 59, on Contract DA 36-039-sc-78184. 15 Apr 59, 48p. 4 refs. AD-220 128.

DESCRIPTORS: *Photoelectric cells, Solar energy, Temperature, Tests.

The highest attained efficiency of GaAs solar cells remains in the 5 to 6% range. Bulk carrier lifetime and series resistance are the major problems yet to be solved. Techniques such as transparent conducting coatings and grid lines have not yielded appreciable improvement. High-temperature measurements (25-150°C have shown that wider energy gap semiconductors do give improved performance which is expected to become more evident as better efficiencies are realized. The problem of the series resistance as manifested by contact and sheet resistance of solar cells has been analyzed. Experimental measurements indicate that the contact resistance is not limiting efficiency of GaAs cells but that the sheet resistance is. The problem of cascading cells of different E_G materials has been considered. It is shown that because of practical limitations E_G>1.4 ev would provide no additional efficiency. Calculations indicate efficiencies of about 19% for two semiconductors and 24% for three, assuming high but ultimately realizable efficiencies for the individual cells. (Author) (See also PB 154 472)

PB 154 474 $3.60

David Sarnoff Research Center, Princeton, N. J. INVESTIGATION OF HIGH-TEMPERATURE PHOTOVOLTAIC SOLAR ENERGY CONVERTER, by J. J. Wysocki, J. J. Loferski, and P. Rappaport. Triannual progress rept. no. 3, 15 Mar-15 July 59, on Contract DA 36-039-sc-78184. 31 July 59, 39p. AD-228 009.

DESCRIPTORS: *Photoelectric cells, Solar energy, Temperature, Tests.

Temperature measurements on comparable efficiency GaAs and Si solar cells show GaAs to be generally superior above 150°C. Higher-efficiency silicon cells are superior at higher temperatures. Further analysis of contact and sheet resistance shows the former to be more serious, although both are capable of limiting cell output. Experimental results indicate contact and sheet resistance are negligible and that carrier lifetime is the limiting factor in present cells. Spectral response curves are shown to be a useful analytical tool in determining diffusion length of processed cells and on predicting limiting efficiencies. Results on InP cells are reported with best efficiency of 3% obtained. Preliminary work on GaP shows Vmax of 1.2 v, but no photo effect due to internal photo emission. (Author) (See also PB 154 473)

PB 155 874 $1.60

Eitel-McCullough, Inc., Belmont, Calif. CERAMIC TUBE REFINEMENT, by Bruce Barnaby and Jack W. White. Interim engineering rept. no. 6, 1 Jan-31 Mar 60, on Contract AF 33(600)36699. [1960] 17p. 2 refs. AD-236 185.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Electron tubes, *Ceramic materials, *Cathodes (Electron tubes), Heating, Temperature, Mass spectrometers.

Getter Evaulation: A satisfactory degree of consistency in the carbon dioxide gettering performance of Cer-alloy coated test structures was attained in the pressure range of 5 to 25 microns for the 1.75 liter system at temperatures of 400° to 600° C. Outgassing of the getter support structure during test was eliminated by an improved support design which allows complete preliminary outgassing. Grid Evaluation: The specific

objective was the comparison of the primary electron emission characteristics of gold and titanium, when they are contaminated with the normal evaporant of oxide-coated cathodes. Plots of current density from the contaminated surface, as a function of time of contamination, yielded a steady state value of current density for a particular emitter temperature. (Author) (See also PB 155 873)

PB 155 870 $1.60

Eitel-McCullough, Inc., San Bruno, Calif.
CERAMIC TUBE REFINEMENT, by John Richter and Warren R. Halperin. Scientific rept. no. 2, 1 Oct-31 Dec 58, on Contract AF 33(600)36699. [1958] 15p. AD-212 161.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Electron tubes, *Ceramic materials, *Cathodes (Electron tubes), Heating, Temperature, Seals, Tests.

Processing on and after pump: The primary objective was optimization of the pump, activation, and aging schedules. A number of losses due to leaks were sustained, attributed to temporary loss of process control resulting from movement of the ceramic metalizing equipment to San Carlos. Grid material evaluation: A test structure employing a planar cathode and a single grid wire stretched parallel to the cathode surface was designed and built. In this device, measured contamination of the grid wire can be monitored by means of primary emission measurements. Getter material evaluation: A dual approach was taken. The first approach for getter material evaluation employed a demountable vacuum system in which getters may be placed for observation. The second approach consisted of the application of various getter materials to parts of a test diode. (Author)

PB 155 871 $1.60

Eitel-McCullough, Inc., San Bruno, Calif.
CERAMIC TUBE REFINEMENT, by John Richter and Warren R. Halperin. Scientific rept. no. 3, 1 Jan-31 Mar 59, on Contract AF 33(600)36699. [1959] 13p. AD-217 534.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Electron tubes, *Ceramic materials, *Cathodes (Electron tubes), Temperature, Metal coatings.

Sixteen test diodes were high temperature life tested. Results indicated further research was necessary to achieve a reliable high temperature seal. A more basic approach was taken, utilizing a special test vehicle. This series of experiments evaluated, at high temperatures, a new metalizing mix in conjunction with plating the rings with various metals, and revealed the value of externally plating the tubes. (Author) (See also PB 155 870)

PB 155 872 $1.60

Eitel-McCullough, Inc., San Bruno, Calif.
CERAMIC TUBE REFINEMENT, by John Richter and Jack W. White. Scientific rept. no. 4, 1 Apr-30 June 59, on Contract AF 33(600)36699. [1959] 19p. AD-226 294.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Electron tubes, *Ceramic materials, *Cathodes (Electron tubes), Seals, Heating, Temperature, Tests.

Tube life at high temperatures: The evaluation of sealing procedures and seal surface treatments was made with the Unodes described previously (AD-217 534). The Unode proved to be an impractical test vehicle and its use was discontinued. Five CD-19 tubes were flame-sprayed with Al_2O_3 as a deterrent against high-temperature seal failure and tested along with 5 standard CD-19 tubes. The coatings were uniform, but too porous to be effective. Grid evaluation: The grid evaluation structure was equipped with an indirectly heated unipotential grid-simulating element which provided uniform element temperature a uniform potential. Two structures incorporating Ti grid-simulating elements were made and tested. There are 2 phases to the test procedure: (1) pretreatment of the surface by cleaning or contamination, and (2) setting test conditions and plotting the data to determine the equilibrium point. Comparison of emission current density vs temperature curves will be the basis for grid material evaluation. Getter evaluation: The demountable vacuum system for evaluation of getters in ceramic tubes was completed. Tests indicated that fresh Ceralloy solutions must be used to coat the electrodes in order to avoid flaking. (See also PB 155 871)

PB 155 873 $2.60

Eitel-McCullough, Inc., San Carlos, Calif.
CERAMIC TUBE REFINEMENT, by John Richter and Jack W. White. Scientific rept. no. 5, 1 July-31 Dec 59, Contract AF 33(600)36699. [1960] 22p. 4 refs. AD-233 471.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Electron tubes, *Ceramic materials, *Cathodes (Electron tubes), Seals, Heating, Temperature, Design.

Seal Evaluation: Two samples of ten CD-16 tubes were subjected to life testing at ambient temperatures of 400°C and 500°C respectively. The test at 400°C was terminated after 500 hours and none of the tubes sustained air leaks during test or after cooling, subsequent to removal. In the life test conducted at 500°C, seal failures occurred after 16 hours, 23 hours, 72 hours, 88 hours and 97 hours (two). After 160 hours, all of the remaining tubes had failed. Getter Evaluation: A further revision of the getter evaluation sub-manifold was necessary, and as a final solution to the leakage problem, the original sub-manifold was replaced with a completely heliarced sub-manifold. The new sub-manifold was incorporated

into the pump system, and the entire system was satisfactorily checked out. Grid Evaluation: A Keithly electrometer, capable of measuring currents as low as 10^{14} amperes, was procured. Efforts to measure emission currents from gold grid simulating elements, at a sensitivity of 10^{-9} amperes with the Keithly electrometer, were frustrated by inherent circuit interference. To solve this problem a test circuit was designed and built to provide a means of measuring currents of the order of 10^{-13} amperes. (Author) (See also PB 155 872)

PB 148 501 $3.60

Electronics Research Lab., U. of California, Berkeley.
A NEW DESIGN APPROACH FOR FEEDBACK AMPLIFIERS, by M. S. Ghausi and D. O. Pederson. Rept. on Contract Nonr-222(74). 12 Apr 60, 38p. 12 refs. Rept. no. 104; Series no. 60, issue no. 274; AD-238 378.

DESCRIPTORS: *Feedback amplifiers, Design.

A new design procedure is developed which permits the realization of desired closed-loop response shape and bandwidth (or rise time) as well as the realization of desensitivity of both the bandedge frequency response and low frequency response, respectively. The design procedure, which is based on the root-locus technique, is straightforward and leads to excellent amplifier designs. To illustrate the technique, a shunt-shunt feedback configuration is used. The basic amplifier is a three-stage c-e transistor cascade. Typical design examples with experimental results are included. (Author)

PB 149 240 $2.60

Electronics Research Lab., U. of California, Berkeley.
THE SPLIT-BAND DISTRIBUTED AMPLIFIER, by L. Scott and D. O. Pederson. Rept. on Contract Nonr-222(74). 27 Apr 60, 22p. 8 refs. Rept. no. 105; Series no. 60, issue no. 276; AD-239 852.

DESCRIPTORS: *Distributed amplifiers, Transmission lines, Configuration, Electronic circuits, Synthesis, Pentodes.

This report is a study of a configuration to achieve broadband amplification. The configuration consists of a combination of the essential features of the parallel chain, split-band amplifier and the conventional distributed amplifier. The conventional distributed amplifier has exceeded the limitation imposed by tube capacitance by absorbing these capacitances in artificial transmission-line structures that form the input and output circuits of the amplifier. The circuit essentially parallels the pentodes, and the plate currents of the pentodes add at the load. The parallel chain, split-band amplifier circumvents the gain-bandwidth limitation by dividing the band into segments or channels and amplifying each channel separately. The transmission characteristic of the overall amplifier is the summation of the amplification characteristics of the independently amplifying parallel chains. Summing and distribution networks are used at the input and output of the amplifier. The realization of summing networks that are compatible with the channel amplifier characteristics is one of the most difficult problems of this broadbanding technique. (Author)

PB 155 914 $7.60

General Electric Co., Schenectady, N. Y
DIELECTRIC MATERIALS IONIZATION STUDY. Interim Engineering rept. no. 5 (Final development rept.) 1 Feb-30 June 54, on Contract NObsr-57408. [1954] 74p. Rept. no. R53GL44-5.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Dielectrics, *Electrical corona, Ionization, Test methods, *Insulating materials, Electric insulation.

This report contains a description of the apparatus used for low frequency and high frequency corona testing of insulations, describes the test procedures, discusses the interpretation of the data including the pattern of corona observed, the effects of internal voids, the effects of the frequency and polarity of the applied voltage and presents data upon the effects of high frequency (one megacycle) corona, the effects of water immersion on corona, breakdown and flashover, and the effects of temperature upon corona, for a wide variety of insulation materials. The report also includes a description of test procedures for location of internal voids in rod stock Teflon intended for manufacture of inserts.

PB 154 466 $3.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
HIGH-POWER TUBE PROGRAM. Semiannual technical summary rept. on Contract AF 19(604)7400, ARPA Order no. 85-60. 31 Dec 60, 36p. 22 refs. AD-250 687.

DESCRIPTORS: *Klystrons, *Beam power tubes, *Electron tubes, *Radar duplexers, S-band, Gas discharges, Secondary emission, L-band, Ultra high frequency, Cathodes (Electron tubes), Electron beams, Processing, Design, Manufacturing methods, Electronics laboratories, Production.

Contents:
Beam input power limitations
Hollow beam - klystron interaction
Multicavity klystron analysis
Beam pulse heating
Beam studies
Biased collector
Cathodes
Secondary emission
Measurements of surface currents in klystron cavities by the perturbation of radiation field
Duplexer investigations
Arc loss in folded cylinders - Comparison with positive columns
S-band instrumentation
L-band instrumentation and investigations
Improving breakdown characteristic of protective cells
Facilities and techniques

PB 155 715 $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
A MICROWAVE SINGLE SIDEBAND MODULATOR, by H. G. Pascalar. Rept. on Contract AF 19(122)458. 22 Apr 58, 28p. 3 refs. Group rept. 48.6; AD-236 271.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Modulators, *Microwave equipment, *Sidebands, Design, Phase shifters, Impedance matching, S-band, Measurement, *Radio receivers, *Radio-frequency spectrum analyzers, Crystals, *Diodes, Waveguides, Waveguide couplers, Silicon.

A phase shift type of microwave single sideband modulator (SSM) employing silicon crystal diodes as modulating elements is described. An S-band SSM was constructed and 30 mc. used as the modulating frequency. Measurements indicated that, at the output, the desired sideband exceeded by at least 20 db the undesired sideband and carrier throughout the (2600 - 3100) mc. band. At the band center, the conversion loss from carrier input to desired sideband output was approximately 10 db; it increased to 13 db at the band edges. Reversing the modulation frequency circuitry from driving to receiving permits the same microwave plumbing to function in a single sideband receiver (SSR). Measurements on the SSR indicated an image frequency suppression of greater than 20 db throughout the (2600 - 3100) mc. band. (Author)

PB 154 569 $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
RADAR TECHNIQUES STUDY, by D. L. Clark and E. J. Kelly. Semiannual technical summary rept. no. 1, 1 July-31 Dec 60, on Contract AF 19(604)7400. 31 Dec 60, 22p. 12 refs. ARPA Order no. 56-61; AD-251 040.

DESCRIPTORS: *Radiometers, *Radar signals, *Detection, Targets, *Noise (Radar), Mathematical analysis, Delay lines, Theory.

Contents:
Radiometry
Detection of signals in non-Gaussian noise
  Simulation of non-Gaussian noise
  Computation results for detection of signals in non-Gaussian noise
Delay-line and other analog signal-processing techniques
Detection theory and signal design.

PB 154 287 $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
NOISE PERFORMANCE OF TRANSISTORS, by D. G. Peterson. Technical rept. on Communications. Sep 60, 37p. 9 refs. LMSD-703100; AD-244 584.

DESCRIPTORS: *Transistors, *Noise (Radio), Tests, Statistical analysis, Mathematical analysis, Instrumentation, Noise generators.

The accuracy with which the Beatie lumped model represents transistor noise performance is experimentally verified. The statistical properties of transistor noise are studied using a laboratory-constructed amplitude-probability density analyzer. The noise model consists of three statistically independent shot-noise generators connected across the lumped elements representing the generation-recombination and diffusion mechanisms of the transistor. In addition, a thermal-noise generator is used to represent the noise contributed by the base spreading resistance. By comparing measurements with calculations based on the model, not only is good over-all agreement obtained, but it becomes evident that certain bias and source conditions allow separate confirmation of the internally postulated noise generators. (Author)

PB 154 284 $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
THE THEORY AND APPLICATIONS OF SIGNAL-FLOW GRAPHS. AN ANNOTATED BIBLIOGRAPHY, comp. by G. R. Evans and J. L. Burroughs. Sep 60, 31p. 83 refs. Special research bibliography SRB-60-10; AD-244 074.

DESCRIPTORS: Bibliography, Control systems, *Servo systems, Data, Sampling, Mathematical analysis, *Operations research.

This search was undertaken to obtain information on the possibilities of the applications of signal flow graphs. In order to make the search more comprehensive, information on the theory of signal flow graphs, as well as applications, is included. (Author)

PB 154 395 $11.00

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
NETWORK PROPERTIES OF DISCONTINUITIES IN MULTIMODE CIRCULAR WAVEGUIDE, by L. B. Felsen and W. K. Kahn. Rept. on Contract DA 36-039-sc-78001, continuation of Contracts DA 36-039-sc-(64424, 71235, and 73219). 7 July 60, 150p. 33 refs. Research rept. PIBMRI-803-60; AD-247 318.

DESCRIPTORS: *Waveguides, Electromagnetic waves, Propagation, Scattering, Mathematical analysis, Theory, Dielectrics, Measurement, *Wave transmission.

Research is concerned with the theoretical and experimental evaluation of the network parameters of obstacle and aperture discontinuities situated in a uniform multimode waveguide. The theoretical considerations, valid for arbitrary waveguide cross sections and an arbitrary number of propagating modes, were applied to the detailed calculation of the discontinuity parameters for specific obstacle configurations in oversized circular waveguide. A resonance technique, employed for the experimental evaluation of the equivalent network parameters of single mode discontinuities in a multimode waveguide, is described. A convenient calibration procedure for eliminating the effects of undesired discontinuites in

the measuring cavity is given, and the extension of resonance measuring techniques to two-mode discontinuities is presented. Experimental arrangements and components appropriate to the above-mentioned circular waveguide modes are described. Detailed experimental results covering a representative range of obstacle dimensions and frequencies are presented. (Author)

PB 153 453 $10.10

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
PROGRESS REPORT NO. 18 TO THE JOINT SERVICES TECHNICAL ADVISORY COMMITTEE, by Ernst Weber. Rept. for 1 Apr-15 Sep 60 on Contract AF 18(600)1505. [1960] 121p. 51 refs. Rept. R-452.18-60; AD-247 223.

DESCRIPTORS: *Microwave equipment, Microwave amplifiers, *Microwave networks, Microwave spectroscopy, *Electromagnetism, Electromagnetic waves, Electron tubes, *Electrical networks, Synthesis, Transmission lines, Control systems, Waveguides, *Metal films, Thin films, *Plasma physics, Surfaces, Impedance, Modulation, Broadband, Nickel, Determination, Free radicals.

Contents:
Electromagnetics
Plasma electrophysics and electronics
Solid state and materials research
Microwave circuits
Network theory
Systems and control

PB 154 396 $13.00

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
A THEORETICAL AND EXPERIMENTAL INVESTIGATION IN MULTIMODE NETWORKS AND WAVEGUIDE TRANSMISSION, by Walter K. Kahn. Rept. on Contracts DA 36-039-sc-78001 and DA 36-039-sc-85321. 21 Sep 60, 186p. 54 refs. Research rept. PIBMRI-818-60; AD-245 501.

DESCRIPTORS: *Waveguides, *Wave transmission, Theory, Electromagnetic fields, Electromagnetic waves, *Transmission lines, Functions, Electrical networks.

This investigation develops an invariant formulation of the properties of a transfer representation for 2N-port networks and the utilization of this formalism to determine optimal transmission properties of such networks; the extension of this formalism to optimal transmission via a super position of modes of a dissipative uniform waveguide, and finally resonance techniques for the experimental evaluation of network parameters descriptive of discontinuities in lossless multimode waveguides. (Author)

PB 155 913 $3.60

Naval Ordnance Lab., White Oak, Md.
NUCLEAR RADIATION EFFECTS IN PERMANENT MAGNETS, by R. S. Sery, D. I. Gordon and R. H. Lundsten. 13 Apr 59, 32p. 10 refs. NAVORD rept. 6276.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Magnets, *Radiation effects, Magnetic properties, Determination.

Permanent magnets exposed to 10^{17} fast nvt at 90°C in the BNL Reactor showed no measurable changes in magnetic properties. The materials irradiated were: 3-1/2 Cr Steel, 36 Co Steel, Alnico II, V, and XII, Cunico, Cunife, Silmanal, fine irons, platinum-cobalt, and oriented and unoriented barium ferrites. Pre- and post-irradiation measurements of (a) demagnetization curves and (b) open magnetic circuit induction were made. Unirradiated controls, held at 90°C for 12 days were also measured. Because of induced radioactivity in the irradiated samples, post-irradiation measurements were made remotely, using the NRL hot-cell facility. (Author)

PB 155 095 $4.60

Naval Ordnance Test Station, China Lake, Calif.
DIGITAL RECORDING TECHNIQUES AND RECORDERS, by Saul Baker. 4 Aug 50, 41p. 7 refs. NAVORD rept. 1214; NOTS 270.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Digital recording systems, Design, Calibration, Signal-to-noise ratio, Data, Coding, Telemetering, Instrumentation.

The general principles of digital recording are discussed and interpreted in terms of the design of digital-recorder components. The advantages and limitations of the digital method are presented, with respect to signal-to-noise ratio, recording range, resolution of the record, and calibration of the recorder. Four methods of coding digital data are described, and the possibilities in techniques of digital-data reduction are suggested. A description is given of two recorders which were specifically designed for internal recording of missile flight and water-entry behavior. (Author)

PB 155 919 $7.60

Ohio Semiconductors Div., Tecumseh Products Co., Columbus, Ohio.
APPLICATION OF THE HALL EFFECT TO BASIC MEASUREMENTS, by N. P. Milligan and R. W. Crawford. Final rept. on Contract AF 30(602)2237. 16 Jan 61, 76p. 5 refs. Rept. A400-4; RADC-TR-61-53.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Semiconductors, Electrical properties, *Waveguides, Radiofrequency power, Measurement, *Ammeters, *Power meters, Design, Conductors, *Electric currents.

A study was made of the practicability of utilizing the Hall effect for making two specific types of basic measurements, namely for measurement of current in a conductor and the measurement of microwave power in a waveguide. As a result of the study, a laboratory model of a D. C. Hall effect milliammeter with range of 5-0-5ma, 50-0-50 ma, and 500-0-500 ma was successfully constructed. Methods of overcoming such problems as drift, ohmic unbalance in the Hall probe and spurious magnetic fields are discussed. The basic theory relating to the use of the Hall effect as a microwave power meter is reviewed. Details of the experimental data taken with InAs and Ge probes are discussed. Data showing that a power meter for specific load conditions can be constructed are shown. The large magnitude of the output voltage from the Hall element casts doubt on its being a Hall voltage. An hypothesis discussing the possibility of the output voltage arising from the Seebeck Effect is forwarded. A recommendation is made that a Hall assembly containing no junctions in the waveguide be fabricated. This "junctionless" assembly could be used in future work to prove or disprove the presence of the Seebeck voltage. (Author)

SCTM-1-61(72) $0.75

Sandia Corp., Albuquerque, N. Mex.
THE ROMOTAR SYSTEM AT SALTON SEA TEST BASE, by W. D. Gutscher. Mar 61, 21p.

PB 154 400 $4.60

Shockley Transistor, Palo Alto, Calif.
HIGH POWER TWO-TERMINAL NEGATIVE RESISTANCE OSCILLATOR, by R. Scarlett and R. Henley. Final rept. for 15 Mar-14 Sep 60 on Contract DA 36-039-sc-85298. [1960] 49p. 7 refs. ARPA Order 40585-PM-60-93-93; AD-247 246.

DESCRIPTORS: *Radiofrequency oscillators, *Oscillator circuits, *Negative resistance circuits, *Diodes, *Radiofrequency generators, Theory, Radiofrequency power, Electron tubes, Design, Semiconductors.

Efforts are being made to carry out a theoretical investigation of the performance of four-layer diodes as generators of RF power. It is intended to calculate ultimate frequency and power limitations, and to determine the device design requirements for obtaining maximum performance. The results are presented of calculations intended to determine the power and frequency capabilities of 4-layer diodes operating as RF power oscillators in a Class C mode. The important features of this mode of operation are described, and an efficient push-pull oscillator circuit shown. From the requirements on the diode parameters for proper operation, the power output and power dissipation are calculated and plotted as a function of frequency. The factors which limit performance and the selection of parameters for maximum efficiency are discussed. Finally, some preliminary experiments verifying the qualitative behavior of the diodes are reported. (Author)

PB 155 774 $6.60

Space Technology Labs., Inc., Los Angeles, Calif.
ADOPTION OF WELDED ELECTRONIC CIRCUITS FOR MISSILE AND SPACE VEHICLES, by Lloyd D. Armstrong. Rept. on Components Packaging Technique Studies, Contract AF 04(647)619. 24 Mar 61, 67p. 16 refs. STL/TR-60-0000-09178.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Spaceships, *Electronic circuits, Welding, Packaging.

This status report details the results of an investigation of welded electronic circuits for application to ballistic missiles and space vehicles. Adaptation of welding to electronic circuits, development of welding process control, and circuit packaging design were studied and are discussed. The report also discusses actual fabrication methods and practices. Included is an evaluation of the basic technique, which indicates that a substantial improvement in reliability as well as considerable reduction in volume and weight can be achieved at no increase in cost. (Author)

PB 155 775 $5.60

Space Technology Labs., Inc., Los Angeles, Calif.
POTTING, EMBEDMENT, AND ENCAPSULATION OF WELDED ELECTRONIC CIRCUITS, by C. Glenn Clark. Rept. on Components Packaging Technique Studies, Contract AF 04(647)619. Nov 60, 54p. 13 refs. STL/TR-60-0000-19354.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Electronic circuits, Embedding substances, Packaging, Molding, Casting.

This report summarizes information on the wide variety of available methods, materials, and techniques for the potting, embedment, and encapsulation of electronic circuits. The proper use of these techniques to protect electronic circuits against the effects of severe environmental conditions requires full consideration of the effects of the casting resin on electronic parts, methods of mounting and packaging of equipment, handling and repair of modules, costs, and thermal effects. The characteristics of seven principal classes of casting resins are discussed, together with the use of resin modifiers including fillers, diluents, and flexibilizers. Various types of molds and molding processes are described as well as the techniques for preprocessing, mixing, pouring, curing, and finishing. A discussion of quality control considerations is included. (Author)

PB 155 773 $6.60

Space Technology Labs., Inc., Los Angeles, Calif.
SURVEY OF MICROMINIATURIZATION OF ELECTRONIC EQUIPMENT, by P. V. Horton and T. D. Smith. Rept. on Contract AF 04(647)309. 31 Dec 59, 62p. 54 refs. STL/TR-59-0000-09957; AFBMD-TR-60-57.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Subminiature electronic equipment, Design, Bibliography, Electronic equipment, Spaceships, *Electronic circuits.

Rapid advances in microminiaturization of electronic equipment will affect missile and space vehicle electronic design within a short period of time. To assess the potential impact of the new techniques, a field and literature survey of current progress has been made. Some manufacturers are fabricating microelements of thin films deposited on very small glass or ceramic wafers; these microelements are then stacked, interconnected, and encapsulated into complete circuits. One firm has deposited complete 14-part circuits on 1/4 square inch of surface. Various semiconductor manufacturers have developed complete circuit modules on silicon or germanium material no larger than a conventional transistor. Other approaches utilize molecular techniques to obtain circuit effects from a single block of material without identifiable electronic parts. Additional firms use resistance welding and small encapsulated printed circuits for high-density packaging of very small parts. Still another organization is developing an evacuated ceramic thermionic circuit module for high-temperature use. A wide variety of fabrication techniques are used, ranging from vacuum, electrical, and chemical depositing of thin films to the growing of semiconductor ribbons. Among methods used are spectrographic plates for photo resists, screen and photolithographic printing, micromachining, air abrasion, ultrasonic machining, and electronic etching.

PB 154 128 $3.60

Stanford Electronics Labs., Stanford U., Calif.
INTERFEROMETRY AND THE SPECTRAL SENSITIVITY ISLAND DIAGRAM, by R. N. Bracewell. Scientific rept. no. 4 on Contract AF 18(603)53. 21 Nov 60, 33p. 24 refs. Stanford Radio Astronomy Inst. pub. no. 4; AFOSR TN-60-1415; AD-249 513.

DESCRIPTORS: *Radio interferometers, Sensitivity, *Radio astronomy, *Antennas, Antenna radiation patterns, Radiofrequency spectrum analyzers, Parabolic antennas, *Radio fields, *Radio waves, Sources, *Solar spectrum.

Basic principles of radio interferometry are expounded and a certain special diagram is established which helps with problems on interferometers, especially those with phase switching or other complications. The information on a record, or interferogram, made by scanning a compact source or target with an interferometer comprising an antenna with two well spaced parts, is all in one complex number, the complex visibility of the interference fringes. Under appropriate conditions the complex visibility observed is equal to the complex coherence, of the field produced by the source, between the points occupied by the two elements of the interferometer. (If the elements are not infinitesimal in extent, the complex visibility is equal instead to a weighted mean of the values of complex coherence between the pairs of points embraced by the elements.) Furthermore, this quantity gives the strength of one spatial Fourier component of the source distribution, in amplitude and phase. To know all Fourier components would require the use of all spacings--in two dimensions this means all vector spacings. Measurements at a finite number of spacings yield the principal solution; if the source is finite in extent only certain discrete spacings need be used. (Author)

PB 154 126 $1.10

Stanford Electronics Labs., Stanford U., Calif.
MONITORING PARABOLOIDAL REFLECTOR ANTENNAS, by G. Swarup and K. S. Yang. Scientific rept. no. 3 on Contract AF 18(603)53. 21 Nov 60, 4p. 3 refs. Stanford Radio Astronomy Inst. pub. no. 3; AFOSR TN-60-1409; AD-249 512.

DESCRIPTORS: *Parabolic antennas, Antennas, Reflectors, Monitors, *Radio astronomy, Instrumentation, Distortion, Determination.

PB 148 922 $2.60

Stanford Electronics Labs., Stanford U., Calif.
STUDY OF ADAPTIVE AND TIME SHARED CONTROL SYSTEMS, by G. Franklin, L. Shaw, and E. Henry. Annual summary rept. on Contract Nonr-225(38). 30 Apr 60, 25p. 6 refs. AD-239 329.

DESCRIPTORS: Automatic, Control systems, Design, Digital systems, Control, *Digital computers, Probability, *Radiofrequency filters, Mathematical analysis, Sampling.

The solution of two problems which arise from the use of a digital controller in an automatic control system are reported. The first of these problems is termed adaptive control and concerns the design of a system which changes its method of control (adapts) to changes in the character of its inputs or other aspects of the control environment. Many adaptive schemes have been proposed in the literature and used with varying degrees of success. The approach taken in the research reported herein is to provide a logical design procedure for a controller which adapts by a choice or decision between a small number of alternatives. The first designs have been directed toward adaptation in the simplest case imaginable, which is in the presence of an input which has two possible states. The schemes which have been derived show improved performance over other alternatives for the same job. The second problem is the time-share problem or the design of a digital controller for the simultaneous control of more process or plant by sequential attention. The questions of possible control assignment schedule and design methods for given assignment schedules have been considered and a number of alternate

solutions to both parts of the problem obtained. A practical solution of the optimal assignment schedule for a given over-all system performance criterion and controller performance constraints remains to be achieved. (Author)

PB 154 127 $2.60

Stanford Electronics Labs., Stanford U., Calif. PHASE ADJUSTMENT OF LARGE ANTENNAS, by G. Swarup and K. S. Yang. Scientific rept. no. 6 on Contract AF 18(603)53. 21 Nov 60, 28p. 21 refs. Stanford Radio Astronomy Inst. pub. no. 6; AFOSR TN-60-1410; AD-249 515.

DESCRIPTORS: *Parabolic antennas, Antennas, Phase studies, *Phase measurement, Radio astronomy, Gas discharges, Monitors, Discharge tubes, Radio waves, Reflection, Test methods, Microwaves, S band, Signal generators.

A technique is described for adjustment of phase paths within large antenna arrays or paraboloidal surfaces which are now in use, or are planned, for radio astronomy. A new suggestion, is to place modulated gas discharge tubes, acting as scatterers, at various points on the paraboloidal surface and to monitor the phase path from a signal generator through the feed at the focus to each discharge tube in turn, and back. By means of a second probe, say a dipole situated at the vertex of the paraboloid, it is possible to triangulate on deflections. The feasibility of this scheme has been established in connection with the large Stanford cross antenna which has an aperture of 1339 wavelengths at 9.1 cm. The phase of the modulated reflected wave produced by the discharge tube is determined by adding it to a reference c-w wave of large amplitude and applying the resultant to a receiver sensitive to the modulating frequency. A null is obtained when the two waves are in quadrature. The coherent detection system allows measurement of the phase of the modulated reflection even when its amplitude is below -130 dbm. (Author)

PB 154 279 $1.10

Stanford Electronics Labs., Stanford U., Calif. RESISTANCE AS DISSIPATION INTO MANY REACTIVE CIRCUITS: LANDAU DAMPING AND NYQUIST'S NOISE THEOREM, by O. Buneman. Rept. on Contract AF 19(604)5480. 23 Nov 60, 4p. 2 refs. Technical rept. no. 104-4; AFCRL TN-60-1160; AD-250 248.

DESCRIPTORS: *Resistance, Resonance, Theory, *Electrical networks, Electrons.

Non-radiative dissipation, such as friction and ohmic resistance, is not a loss of energy but its dispersal into a large number of degrees of freedom. Irreversibility is the improbability of reconcentration of energy into its initial ordered form. One would therefore expect a network of very many undamped resonating circuits to exhibit resistive properties in its transient response. Indeed, it should be possible to simulate resistances by such purely reactive elements, in close analogy with the physical process of ohmic heating, i.e., conversion of electrical energy into molecular and lattice vibrations. (In a closed, non-radiating system these are undamped.) (Author)

PB 154 131 $2.60

Stanford Electronics Labs., Stanford U., Calif. TRANSISTOR NOISE PERFORMANCE, by D. G. Peterson. Rept. on Contract Nonr-225(44). 15 Apr 60, 26p. 7 refs. Technical rept. no. 1505-3; AD-235 937.

DESCRIPTORS: *Transistors, Noise, *Noise generators, Measurement, Mathematical analysis, Instrumentation.

Open-ended Terms: Beatie

The accuracy with which the Beatie lumped model represents transistor noise performance is experimentally verified. The noise model consists of three statistically independent shot-noise generators connected across the lumped elements representing the generation-recombination and diffusion mechanisms of the transistor. In addition, a thermal-noise generator is used to represent the noise contributed by the base spreading resistance. By comparing measurements with calculations based on the model, not only is good over-all agreement obtained, but it becomes evident that certain bias and source conditions allow separate confirmation of the internally postulated noise generators. (Author)

PB 154 369 $1.60

Stanford Electronics Labs., Stanford U., Calif. A WIDE BAND SINGLE DIODE PARAMETRIC AMPLIFIER USING FILTER TECHNIQUES, by A. G. Little. Scientific rept. no. 9 on Contract AF 18(603)53. 30 Dec 60, 11p. 1 ref. Stanford Radio Astronomy Institute Publication no. 9; AFOSR-31; AD-250 728.

DESCRIPTORS: Broadband, Instrumentation, *Extraterrestrial radio waves, Diodes, *Microwave amplifiers, Radio astronomy, Sources, Radiofrequency filters, S band, *Microwave spectroscopy, Tuned circuits.

Open-ended Terms: Parametric amplifiers, Spectroheliographs.

The Stanford Radio Spectroheliograph is potentially a valuable instrument for studies of cosmic radio sources as well as of the sun but, at the moment, the sensitivity is not wholly adequate for signals of cosmic origin. To improve the sensitivity it is necessary to increase the bandwidth as well as to decrease the noise figure, and for this purpose a parametric amplifier has been developed. This amplifier uses filter techniques to achieve a broad band, and has provided 200 mc bandwidth at 3.3 kmc, with a gain of 16 1/2 db and a noise figure of 1.8 db. (Author)

PB 154 399 $3.60

Stanford Research Inst., Menlo Park, Calif.
APPLIED RESEARCH IN MICROMINIATURE FIELD EMISSION TUBES, by W. W. Hansen. Quarterly progress rept. no. 4, 1 Apr-1 July 60, on Contract DA 36-039-sc-84526. July 60, 33p. 1 refs. SRI Proj. 2937; AD-245 349.

DESCRIPTORS: *Subminiature electron tubes, *Field emission, Electron beams, Thin films, Materials, Design, *Refractory materials, Insulators, Metals.

Tungsten emitter tips with radii of about 1000 Angstrom units were manipulated into and through the holes in a 1000 mesh copper screen used as a control grid. Grid voltage required to draw a given emitter current decreased to a minimum and then increased as the tip entered and passed through the hole. A minimum of about 500 volts was required for an emission current of 1 microampere. Grid currents became less than 0.01 percent of the emitter current as the tip approached and passed through the hole. An emission current of 0.1 microampere was drawn by 30 grid volts from a tip placed about 1000 Angstrom units below a grid wire. This low voltage is indicative of results expected with the use of special grids, now being fabricated. The holes of these grids will be about 5500 Angstrom units in diameter. The effect of plate-voltage change on emitter current was always negligible in the experiments done but the division of emitter current between plate and grid was influenced by such changes. (Author) (See also PB 152 670)

PB 154 555 $4.60

Technical Research Group, Syosset, N. Y.
LOW SILHOUETTE END-FIRE ARRAYS, by Alan F. Kay. Final rept. on Contract AF 19(604)5711. 25 July 60, 46p. 6 refs. TRG-133FR; AFCRL-TR-181; AD-250 968.

DESCRIPTORS: *Transmission lines, *Antennas, Antenna horns, *Microwave equipment, Tests, *Antenna radiation patterns, *Power dividers, Coaxial cables, Design, S band, Lobing.

Open-ended Terms: Yagi Antennas.

Several six-yagi S band arrays were designed and tested. The goal of 25 db gain and 25 db sidelobe level was not quite achieved. Near field measurements and analysis show why. Design and performance data for S band power dividers, feeds, individual yagis, and yagi arrays of a number of designs are given. (Author)

PB 171 270 $1.75

Transitron Electronic Corp., Wakefield, Mass.
RESEARCH ON EFFICIENT PHOTOVOLTAIC SOLAR ENERGY CONVERTERS, by Brian Dale. Final rept. for 2 Apr 59-1 Apr 60 on Contract AF 19(604)5585. 23 June 60, 76p. 3 refs. AFCRL TR-60-379.

DESCRIPTORS: *Photoelectric cells, Design, Tests, *Silicon, *Solar energy, *Semiconductors.

The performance of a variable energy gap solar cell is compared with that of a single gap cell. It is found that no major advantage is offered by the variable gap cell, although small improvements could be obtained provided that the lifetimes could be maintained comparable with those in the single gap cell. Two methods of reducing the reflection loss from the surface of a solar cell are described. One uses the principle of destructive interference between light reflected from either side of a quarter wavelength film of silicon monoxide. The other uses a specially shaped silicon surface which requires an incident beam to be reflected several times before escaping. Both methods reduce the reflectivity to a very low value.

PB 154 398 $3.60

Watkins-Johnson Co., Palo Alto, Calif.
DEVELOPMENT OF A LOW-NOISE TRAVELING-WAVE TUBE FOR THE FREQUENCY RANGE 1980 - 4040 MCS, by E. W. Kinaman. Final rept. for 15 Aug 59-15 June 60 on Contract DA 36-039-sc-84520. 9 Sep 60, 31p. 6 refs; AD-244 436.

DESCRIPTORS: *Traveling wave tubes, Electron tubes, Ultra high frequency, *Noise (Radar), *Microwave amplifiers, Superhigh frequency, Design, Reduction, Electron guns, Noise (Radio).

The design and characteristics are reported of the WJ-211, an ultra low-noise traveling-wave amplifier covering the 1980-4040 mc band. The tubes show full band noise figures under 4.8 db and spot noise figures as low as 2.4 db. Gain variations across the octave range are typically less than 5 db. A fairly comprehensive group of "application-type" measurements are presented, complimenting the typical noise figure and gain characteristics, to provide evaluation material from the system as well as tube viewpoint. Recommendations are made outlining the direction future work should take to "round out" this important low noise device. (Author)

Ordnance, Missiles, and Satellite Vehicles

PB 154 715 $2.60

Ammunition Group, Picatinny Arsenal, Dover, N. J.
EVALUATION OF ABSORBENT AS AN EXUDATION PREVENTATIVE IN THE 8 INCH M106 SHELL, by Edward Jescerzewski. Nov 60, 25p. Technical rept. DB-TR: 1-60; AD-250 569

DESCRIPTORS: High explosive ammunition, *Projectiles, Fluid flow, TNT, Moisture, Storage, Absorption, Calcium compounds, Silicates, Desiccants, Mixtures, Temperature, Loading, Production, Tests.

Open-ended Terms: M106 Projectiles, 8 in.

It was intended to use the 8 inch M106 HE Shell in testing the absorbent for the prevention of TNT exudation. However, the project was cancelled due to curtailment of production schedules of this shell. High

temperature storage tests were completed prior to project cancellation and results indicate that the absorbent was 100% effective in preventing TNT exudation, when incorporated into the explosive using a method similar to standard production methods. (Author)

PB 155 918 $9.10

Army Ordnance Corps, Washington, D. C.
ORDNANCE ENGINEERING DESIGN HANDBOOK: BALLISTIC MISSILE SERIES: PROPULSION AND PROPELLANTS. May 60, 101p. 121 refs. Ordnance Corps Pamphlet ORDP 20-282.

This report released for sale to the public 1 June 61.

DESCRIPTORS: Rocket motors, *Propulsion, *Propellants, Handbooks, Ordnance.

This Handbook has been prepared as one of a series on Ballistic Missiles. It presents information on the fundamental operating principles of propulsion systems as found in ballistic missiles, with discussions of propellants which have been found practicable or which have theoretically attractive possibilities. Criteria are presented whereby the performance of propulsion systems can be judged.

PB 155 712 $3.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SATELLITE TRACKING FROM SEVERAL COORDINATED DOPPLER RECEIVING STATIONS, by William S. McDonald. Rept. on Contract DA 04-495-ORD-18. 5 Sep 58, 32p. 3 refs. JPL External Publication 554.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Satellite vehicles, Tracking, *Doppler tracking, *Doppler systems, Satellite vehicle trajectories, Mathematical analysis.

A network of doppler satellite-tracking stations operated by independent organizations was established in the Southern California area for tracking Explorers I and III (1958 α and 1958 γ). On the first pass, emphasis was placed on rapid data reduction and analysis to give immediate information on the orbital elements, perigee in particular. For launch conditions not too far from nominal, perigee was calculated within a few kilometers from first-pass data. Data analysis was carried out largely by graphical techniques. On later passes, an analog method was used to triangulate the satellites' position. Additional stations were added to the network for tracking Explorer IV (1958 ϵ). Orbit computation was done by a least-squares-fitting routine on a medium-speed digital computer. This routine was capable of using data from a single pass by several stations or from several passes by a single station. Microlock receivers equipped with electronic counters and digital printouts made available comparatively noise-free doppler-vs-time records during the actual satellite transit. (Author)

UCRL-6311 $0.75

Lawrence Radiation Lab., U. of California, Livermore.
THE HUGONIOT EQUATION OF STATE OF ROCKS, by David B. Lombard. Rept. on Contract W-7405-eng-48. 28 Feb 61, 28p.

PB 171 291 $1.00

Life Support Systems Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
POTASSIUM SUPEROXIDE PASSIVE AIR REGENERATION STUDIES FOR MANNED SEALED ENVIRONMENTS, by Donald A. Keating and Konrad Weiswurm. Rept. on Equipment for Life Support in Aerospace. Dec 60, 31p. WADD Technical rept. 60-707; AD-252 127.

DESCRIPTORS: *Closed cycle ecological systems, Air, Purification, Potassium compounds, Dioxides, Carbon dioxide, Water vapor, Absorption, *Oxygen, Space capsules, Human engineering, Oxygen consumption.

The feasibility of using solid chemicals passively to absorb water vapor, remove carbon dioxide, and supply oxygen in sealed environments for life support in aerospace flight was investigated. Sealed environment research using humans as subjects demonstrated that proper regeneration of the air can be attained without using blowers, fans, or electric power. The sealed environment experimentation indicates that approximately 0.33 pound of potassium superoxide per hour is required to passively regenerate the sealed environment for one man and to supply metabolic oxygen without using electric power. (Author)

PB 171 795 $1.00

Naval Ordnance Lab., White Oak, Md.
BERYLLIUM, ACTUAL AND POTENTIAL RESOURCES, TOXICITY, AND PROPERTIES IN RELATION TO ITS USE IN PROPELLANTS AND EXPLOSIVES, by Russell McGill. 14 Nov 60, 38p. 33 refs. NAVWEPS rept. 7346; AD-253 297.

DESCRIPTORS: *Beryllium, Sources, Toxicity, Properties, Geology, Metallurgy, *Propellants, *Explosives, Materials.

Those who wish to consider beryllium as an ingredient of propellants or explosives should be familiar with the current and potential supply of this element. Likewise they should comprehend the toxicity of beryllium and its compounds. The objectives of this report are provision of information about the actual and potential supply of beryllium and about the toxicology of beryllium and its compounds. Metallic beryllium will not be available in quantity if nothing better than the primitive methods of mining now in use, utilization of only the richest ores, and complex and inefficient methods of extracting beryllium oxide do not make way for better methods. If mining and extraction of beryllium are not improved, plans should not be made to use more than small quantities of beryllium in explosives or in propellants. (Author)

PB 171 790 $1.25

Naval Ordnance Lab., White Oak, Md.
CHARACTERIZATION OF SQUIB MK 1 MOD 0. CAPACITOR SENSITIVITY INSTRUMENTATION, by J. N. Ayres. Rept. on Proj. Hero. 10 Jan 61, 42p. 1 ref. NAVWEPS rept. 7308; AD-253 541.

DESCRIPTORS: *Electric bridges, Wire, Firing mechanisms, *Electric igniters, *Electric detonators, Sensitivity, Capacitors, Instrumentation, Design.

Instruments and techniques have been developed to determine the statistical distribution function for the sensitivity of EEDs such as the Squib Mk 1 when fired by the capacitor discharge method. The design of the system has been oriented toward minimum distributed resistance and capacity without excessive distributed inductance. The control of input energy is better than ± 0.5%. The upper and lower limits of energy transfer have been determined for various input energies and are presented in equation and in tabular form. Monitoring, by cathode ray oscillography and with an ergmeter, permitted the measurement of the firing system efficiency and the detection of switching anomalies, which, in turn permitted the correction and censoring of data. (Author)

PB 171 791 $0.75

Naval Ordnance Lab., White Oak, Md.
CHARACTERIZATION OF SQUIB MK 1 MOD 0. 5 MEGACYCLE BURST SENSITIVITY, by Lawrence Green and Charles Goode. Rept. on Proj. Hero. 16 Dec 60, 25p. 3 refs. NAVWEPS rept. 7309; AD-252 371.

DESCRIPTORS: *Electric detonators, *Electric igniters, Electric bridges, *Electronic circuits, Firing circuits, Sensitivity, Radiofrequency pulses, Impedance, Resistance, Heat transfer, Calibration, Design.

The response of the Squib MK 1 to energy supplied as a constant current (RMS) pulse at 5 megacycles was measured. The response was compared to the results obtained with DC constant current pulses. The results obtained were consistent with the theoretical heating: cooling model of the squib in that within experimental error the same response was obtained for both the DC and 5 megacycle cases if the RMS value of the current was used in place of the DC current value. This result is exactly as predicted by the electrothermal equations previously developed for describing the response of wire bridge electro-explosive devices. (Author)

PB 171 792 $0.50

Naval Ordnance Lab., White Oak, Md.
A COOLING CURVE GENERATOR AND ITS APPLICATION TO ELECTRO-EXPLOSIVE DEVICE STUDIES, by Louis A. Rosenthal (Rutgers U.). Rept. on Proj. Hero. 15 Dec 60, 20p. 3 refs. NAVWEPS rept. 7313; AD-252 372.

DESCRIPTORS: *Exploder mechanisms, Electric detonators, *Electric bridges, Wire, Circuits, Temperature, Theory, *Cooling, *Generators, Design.

The thermal parameters of the bridge wire of an electro-explosive device (EED) can be evaluated by studying the cooling curve of the bridge wire after a temperature excursion. A generator capable of rapidly heating the bridge wire of an EED and then presenting the cooling curve trace of an oscilloscope is described. The resistance excursion can be related to the heat capacity, and the exponential cooling is a measure of the thermal time constant. The theory and design together with typical observations are presented. (Author)

PB 154 435 $4.60

Naval Weapons Lab., Dahlgren, Va.
EXPLOSION BULGE TEST EVALUATION OF 1" AND 2" HY-100 STEEL PRIME PLATES, by W. H. Hall. Final rept. 18 Jan 61, 46p. 5 refs. NWL rept. no. 1735; AD-250 707.

DESCRIPTORS: *Armor plate, Ballistics, Cerium alloys, Explosions, Metal plates, Mechanical properties, Pentolite, Tests, Lanthanum compounds, Temperature, Steel, Rare earth compounds.

The HY-100 steel prime plates did not exhibit quite as much ductility as ordinarily is shown by HY-80 plates when tested under the same conditions. All fractures were comparatively short and were of shear type. The addition of rare earths in the form of LanCerAmp to the HY-100 steel appeared to be substantially beneficial to the explosion bulge test properties. The HY-100 steel plate material did not show any tendency toward brittleness in the presence of sharp notches at the 32°F test temperature.

PB 156 022 $4.60

Pitman-Dunn Labs. [Group] Frankford Arsenal, Philadelphia, Pa.
AN ANALYSIS OF THE GAS FLOW FROM A VERY HIGH PRESSURE NOZZLE, by C. N. Kelber and S. Jarvis, Jr. Dec 52, 41p. 4 refs. Rept. no. R-1107.

This report released for sale to the public 1 June 61.

DESCRIPTORS: Nozzles, *Gas flow, Analysis, Recoilless rifles, Blast, Theory.

The study of the blast from recoilless rifles requires a theoretical analysis as a preliminary step to an extensive experimental mapping of the blast field. To this end, a theoretical analysis of the flow from a nozzle has been made. A single, wedge shaped nozzle with 7° half-angle of divergence was considered. The ratio of exit height to entrance height of the nozzle is $\sqrt{2}$:1. Chamber pressure and temperature have been assumed to be 5400 psi and 2400° K, respectively. The principal feature of the flow is a concentrated, almost stationary, region of strong shock called the Mach disk. This was not located in the course of the usual calculations because of the limited assumptions of the theory. On the basis of the growth of turbulence in the boundary layer, the distance of the Mach disk from the exit section of the nozzle was found to be between 40 and 140 exit diameters, the first value

being the more probable. The pressure and temperature after the shock are 40 psi and 2300° K in the first case, 14.6 psi and 3100° K in the second case. Mach numbers as high as ten occur in the flow. A detailed map of the flow up to a point 140 exit diameters away from the exit section is given. This map should provide a guide for the study of the blast from recoilless rifles, since it enables one to interpret better the results of experimental studies. Furthermore, the location of the Mach disk can serve as a criterion for further improvements in the theory. (Author)

PB 154 350 $5.60

Poulter Labs., Stanford Research Inst., Menlo Park, Calif.
SOME PROPERTIES AND APPLICATIONS OF SHOCK WAVES, by G. E. Duvall. Rept. on Contract AF 49(638)625. 17 Oct 60, 54p. 78 refs. SRI Proj. no. GU-2912; AFOSR TN-60-1185; AD-250 114.

DESCRIPTORS: Shock waves, *Detonation, *Detonation waves, Solids, Reflection, Phase transitions, *Plasticity, *Elasticity, Tests, Test methods, Explosives, Impact shock, Projectiles, Pressure, Molybdenum, Physical properties, Entropy, Hydrodynamics.

Detonations and the shock waves they produce in inert materials are described qualitatively. Equations of the shock transition are given and applied in an example to obtain the amplitudes of shocks produced in several solids. Methods for measuring the equations of state of solids with shock waves are described and the reflection of a shock wave at a free surface is discussed. It is shown how phase transitions in materials give rise to multiple shock waves and how these in turn can be used to study transitions. There are unexplained discrepancies between static and shock-induced phase transitions, and the explanation of these may shed new light on the mechanisms of transition. Plastic yield is shown to also produce multiple shocks in solids, one of which is an elastic wave. Measurements of this forerunning elastic wave have been reported by several investigators, and these are presented as dynamic yield strengths, which are compared to static values. Results indicate the plastic yield mechanisms to be similar in static and shock phenomena. The shock following the elastic wave is discussed in terms of dislocation theory and the Hugoniot from an elastic-plastic model is compared with that from a hydrodynamic model. (Author)

PB 154 353 $11.00

Rosemount Aeronautical Labs., U. of Minnesota, Minneapolis.
WIND TUNNEL INVESTIGATION FOR BASIC AND ADVANCED ROCKET SLED CONFIGURATIONS FROM M = 0.5 TO M = 4.0, by Rudolf Hermann and Frederick Moynihan. Rept. on Contract AF 29(600)2229. Sep 60, 148p. 5 refs. RAL-RR-175; AFMDC-TR-60-30; AD-250 197.

DESCRIPTORS: *Rocket propelled sleds, Tests, *Wind tunnels, *Aerodynamic configurations, Design, Lift, Drag, Pressure, Measurement, Test facilities.

Results of wind tunnel measurements of lift, drag, pitching moment, and center of pressure location for families of rocket sleds mounted on a simulated Holloman track section are presented and discussed. Mach number range is from 0.5 to 4.0. Basic sled families consisted of rectangular cross-section bodies of varying width with vertical wedge noses and a circular cross-section body with various conical noses. "Second generation" sled shapes investigated consisted of lift reducing shapes such as cone-paraboloid noses mounted on a circular cross-section body (with and without a downward cant), semi-pyramid noses mounted on various rectangular cross-section bodies, and semi-pyramid after-bodies mounted on the top of a sled. Orientation variables include height above the trough and angle of attack. The principal ground effect was generation of a lift load, which was for most basic sled shapes positive over the whole speed range. For many sleds the lift coefficient increased with Mach number. Sled drag was unaffected for sleds mounted above the rail level. Orientation of the basic sled shapes to small negative angles of attack or increased heights above the trough were effective means of reducing the lift. (Author)

PB 156 023 $7.60

[Space Sciences Lab.] General Electric Co., Philadelphia, Pa.
FEASIBILITY STUDY FOR HYPERVELOCITY PROJECTOR, by Myron H. Bengson, Frank J. Willig, and T. K. Slawecki. Rept. no. 1-AF-1 on Contract AF 08(603)4579. May 59, 71p. 10 refs. APGC-TN-59-64; AD-233 047.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Hypervelocity guns, Design, *Pellets, Acceleration, *Thermodynamics, *Gases, Dynamics, Mathematical analysis, *Electric guns, Projectiles, Reliability, Maintenance.

The results are described of a feasibility study designed to provide a final theoretical design of a hypervelocity projector capable of accelerating a 25 grain projectile to 50,000 ft/sec. The results of the study indicate that such a projector is feasible and recommend that a projector be built on a building block principle. This would entail the building and testing of each stage separately before building the next stage. The report includes discussion and development of the theory, sample calculations, charts and graphs for a nine stage projector, and a section devoted to the experimental work testing the principles, with photographs, tables and electrical schematics of equipment used. Included are the design of a final type projector with a discussion of the design reliability and the requirements for maintenance of the completed unit. (Author)

PB 154 320 $8.60

Temple U. [Philadelphia, Pa.]
RESEARCH DIRECTED TOWARDS THE STUDY OF TRANSDUCING METEORIC IMPACTS, by J. Lloyd Bohn, Otto P. Fuchs and others. Final rept. for 16 Jan 56-15 Oct 59, on Contract AF 19(604)1894. 1 Dec 60, 96p. 9 refs. AFCRL TR-60-436; AD-249 949.

DESCRIPTORS: *Meteorites, Atmosphere, Drag, *Impact shock, *Rockets, *Recording devices, Instrumentation, Transistor amplifiers, Penetration, Velocity, Measurement.

Contents:
Transistor micrometeorite amplifier
Preliminary investigation (1956)
Transistors
Audio amplifiers
The equivalent circuit of the 2N94 transistor
Transport factor Beta and short circuit current-transfer ratio Alpha
Tuned sub-radio frequency amplifier circuit
Extended range amplifier
Double output and special amplifiers
Block diagram of the three pulse system
Dual output amplifiers
Report on micrometeorites

PB 154 414 $2.60

Watertown Arsenal Labs., Mass.
WATERTOWN ARSENAL LIGHT-GAS GUN, by E. N. Hegge and J. P. McDonough. Dec 60, 27p. 8 refs. Technical rept. no. WAL TR 761/64; AD-249 527.

DESCRIPTORS: *Hypervelocity guns, Design, Helium, Gases, *Armor plate, *Terminal ballistics, Cartridge cases, *Propellants, Tests, Pistons, Plastics, *Interior ballistics, *Exterior ballistics, *Subcaliber projectiles, *Projectiles, *Armor piercing ammunition, *Hypervelocity projectiles, Penetration, Resistance.

Open-ended Terms: 20mm; 30mm.

A simple, practical, low-cost light-gas gun was developed by the Watertown Arsenal Laboratories to conduct terminal-ballistic studies in the velocity range of 6000 to 13,000 fps. Standard cartridge cases and propellants are used to propel a lightweight plastic piston to compress the light gas (helium). The light gas is shaped to flow uniformly behind the projectile through the launching tube or rifled barrel by a disposable cone of plastic material which also serves as a buffer to decelerate the piston without appreciable damage to any major structural component. Either full-caliber conventional shear-type projectiles or subcaliber projectiles, fragments and other irregularly shaped missiles can be fired, the latter by means of plastic-discarding-carrier techniques, in either smooth-bored launching tubes or rifled barrels. Firing rates up to 20 rounds per day are easily attained. (Author)

Sanitation and Safety Engineering

PB 154 365 $8.10

Army Engineer Research and Development Labs., Fort Belvoir, Va.
DEVELOPMENT AND EVALUATION OF THE MOBILE WATER PURIFICATION UNIT, by Aldelmo Ruiz and Richard P. Schmitt. 24 Feb 54, 85p. Interim rept. 1343.

DESCRIPTORS: Water, Mobile, Water supplies, *Distilling plants, *Water filters, *Purification.

PB 154 366 $3.60

Army Engineer Research and Development Labs., Fort Belvoir, Va.
TEST AND EVALUATION OF 600-GPH, AIRBORNE WATER-PURFICATION EQUIPMENT, by Raul Rodriguez. 16 Oct 57, 39p. Technical rept. 1503-TR.

DESCRIPTORS: *Water, Airborne, Water supplies, *Distilling plants, *Water filters, *Purification.

This report covers the development and engineering test of water-purification equipment suitable for the production of a potable water supply from turbid and contaminated surface water sources by the Engineer organizations attached to or supporting the combat elements of airborne force. Two identical engineer-service test units were fabricated by Permutit, Inc. and designated as Unit No. 1 and Unit No. 2, and engineering tests treating Potomac River water were performed. Unit No. 1 was operated for an extended period. As information was obtained, Unit No. 2 was modified to improve or simplify design. Engineering test of the modified Unit No. 2 was conducted simulating field operating conditions. The report concludes that: (a) The 600-GPH Water-Purification Unit installed in a standard Ordnance, 1 1/2-ton trailer meets all the military characteristics for which it was tested. (b) Substitution of the special 1 1/2-ton, drop-frame-type trailer will not change the technical performance of the unit and will permit loading and unloading of the unit in a C-123-type aircraft for parachute delivery.

PB 171 802 $1.00

Federal Aviation Agency, Atlantic City, N. J.
FIRE-RESISTANCE STUDY AND PRELIMINARY EVALUATION OF THE FIRE-DETECTION AND EXTINGUISHING SYSTEMS OF THE LOCKHEED HERCULES (AF C130A) AIRPLANE POWERPLANT, by Joseph Osman. Final rept. on Task no. 59-215.1. Sep 60, 33p.

DESCRIPTORS: *Fire detectors, *Fire extinguishers, Tests, Aircraft fires.

Tests were conducted on a Lockheed C-130A powerplant and adjacent wing section primarily to obtain information as to the fire resistance of all associated equipment and structural components when subjected to an uncontrolled fire during simulated cruise flight conditions. In addition, a preliminary evaluation of the aircraft's fire-detector and extinguishing systems was undertaken to determine their effectiveness under ground and flight operating conditions. An uncontrolled fire in Zone 2 of the C-130A powerplant resulted in considerable damage to the nacelle and equipment and structural components in this area. Flames did not penetrate the firewall and fire damage to Zones 1 and 3 were slight. Flames penetrating the nacelle skin did not impinge on the wing surface. The aircraft's fire detector system provided rapid detection of test fires originated in Zone 2 under

ground and simulated flight conditions. The extinguishing system tests were too limited to draw definite conclusions. However, four fires originating in Zone 2, two each under simulated ground and flight operating conditions, were successfully extinguished.

PB 154 081 $1.60

Naval Civil Engineering Lab., Port Hueneme, Calif. POLAR CAMP WATER SYSTEMS, by W. R. Nehlsen. Final rept. 30 Dec 60, 12p. 1 ref. Technical rept. R-122; AD-249 483.

DESCRIPTORS: *Water supplies, Arctic regions, Military facilities, *Naval shore establishments, Climatic factors, Terrain, *Water, Acceptability, Purification, *Water filters, Sea water, Sewage, Disposal, Distilling plants, Snow, Melting, Effectiveness.

Polar climate and terrain make normal water supply systems difficult or impossible to construct at polar camps. As a result, Navy forward bases have used expensive systems which have often proven unsatisfactory. This report uses 25- to 500-man camps as a basis for improvement studies on polar water supply, and it classifies water supply problems according to available water sources. Better water with less work and cost would improve the habitability of polar camps. Drinking water can best be made palatable by adsorptive filtering. Man-power effort and costs can be reduced by conserving fresh water, using salt water where available, using waste heat, and efficiently mechanizing snow handling. Technical studies required include developing or testing taste and odor filters, sea water access lines, snow-handling equipment, integrated distillation and power equipment, and adaptation of facilities to polar camp buildings. (Author)

Ship Building

PB 154 707 $4.60

David Taylor Model Basin, Washington, D. C. ANALYSIS OF STRESSES AT JUNCTURES OF AXISYMMETRIC SHELLS WITH FLEXIBLE INSERT RINGS OF LINEARLY VARYING THICKNESS, by Richard V. Raetz. Jan 61, 44p. 9 refs. Rept. 1444; AD-251 087.

DESCRIPTORS: *Conical bodies, *Cylindrical bodies, Joints, *Stresses, Rings, *Deformation, Mathematical analysis, *Submarine hulls.

The elastic deformations of a short, flexible, tapered ring under axisymmetric edge loading and uniform pressure are investigated. The ring is treated as a thin cylindrical or conical shell of short length and linearly varying thickness. A modified Geckeler-type approximation is used for the conical shell. Equations are derived for the elastic behavior of some typical shell junctures utilizing insert rings with tapered sections. A numerical example is given which indicates that maximum discontinuity stresses in a typical reinforced cone-cylinder juncture would be reduced by 33 percent by use of a flexible, tapered ring. The additional highly localized stresses due to notch effects have not been considered. (Author)

PB 155 710 $1.60

Naval Engineering Experiment Station, Annapolis, Md MODIFIED 12% CHROMIUM TURBINE BLADE STEELS, by W. Lee Williams. 12 Apr 51, 17p. E.E.S. rept. 4B(5)066711.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Turbine blades, Materials, *Steel, Tests, Temperature, Tensile properties, *Chromium, *Main propulsion plants.

Progress is reported concerning tests of modified 12% chromium turbine blade steels developed for improved strength at the higher steam temperatures, especially those above 950°F. The alloys reported were produced to the following nominal compositions: (1) Standard Type 403, wrought. (2) Type 403 plus 3% W, 5% Co and 1/5% V. (3) Type 403 plus 1/2% Mo, 1/4% W, and 1/5% V. (4) Type 403 plus 3% W (three carbon levels). (5) Standard Type 403, precision cast. Various heat treatments were investigated to determine the most suitable quenching and tempering temperatures for the turbine blade application. The normal and elevated temperature tensile properties, and the creep and stress-rupture properties, were determined and reported. (Author)

PB 155 711 $1.60

Naval Engineering Experiment Station, Annapolis, Md. MODIFIED 12% CHROMIUM TURBINE BLADE STEELS, by W. Lee Williams. Progress rept. no. 2 (final). [1951] 18p. E.E.S. rept. 4B(6)066711.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Turbine blades, Materials, *Steel, Tests, Temperature, Tensile properties, *Main propulsion plants, *Chromium.

Two steels new to this investigation are included in this report. One of these contained 0.4% Cb as a modifying agent. The other steel was modified with nominal additions of 1% Mo, 1% W and 0.3% V. The information obtained for these steels consisted of normal and elevated temperature tensile properties, elevated temperature creep and stress-rupture properties, and the effects of tempering temperature on hardness. On the basis of these data, it was concluded that the 1% Mo, 1% W, 0.3% V steel represented the best choice from the standpoint of the highest properties consistent with the least expenditure of critical alloying elements. (Author) (See also PB 155 710)

FOOD, HANDLING, AND PACKAGING EQUIPMENT

TID-6700 $2.00

Massachusetts Inst. of Tech., Cambridge.
OUTLINE OF PROJECTS TO DETERMINE THE FEASIBILITY OF RADIATION PRESERVATION OF MARINE PRODUCTS, by J. T. R. Nickerson, S. A. Goldblith and others. Rept. on Contract AT(30-1)-2329. Apr 61, 87p.

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

PB 155 752 $7.60

Bostrom Mfg. Co., Milwaukee, Wis.
A STUDY OF "TRUCK RIDE" CHARACTERISTICS OF STANDARD CUSHION VS. SUSPENSION TYPE SEATS IN MILITARY VEHICLES, by A. K. Simons, A. O. Radke and W. C. Oswald. Final rept. on Contract DA 11-022-ORD-1999. 16 Mar 56, 72p. 28 refs. AD-88 048.

This report released for sale to the public 1 June 61.

DESCRIPTORS: Vehicles, Vibration, *Vehicle seats, Tests, Human engineering.

The vibrations to which a truck driver and assistant are subjected while using a standard seat cushion assembly and suspension seats were electronically recorded while a truck was being driven over permanent test courses at the Aberdeen Proving Ground. The average maximum 11/5 truck cab accelerations (1 g) in vertical, transverse, and longitudinal directions exceeded established-human-tolerance levels. The standard driver's seat amplified the truck cab accelerations by an average of 124% and the companion's seat amplified accelerations 139%. The suspension seats attenuated basic cab motions to the extent of transmitting an average of 80% for suspension A and an average of 69% for suspension B; the frequencies were 2.5 c. It was recommended that consideration be given the improved ride values afforded by suspension-type seats in certain military vehicles which are now using conventional seats.

Engines and Propulsion Systems

PB 153 966 $6.60

Cross-Malaker Labs., Inc., Mountainside, N. J.
KINETIC STUDY OF ROCKET EXHAUST GASES, by Richard A. Rossi and John Feduchak. Progress rept. no. 2 on Contract DA 30-069-ORD-2918. Oct 60, 63p. 350 refs. Rept. no. CM 103-2; AD-249 314.

DESCRIPTORS: *Rocket motors, *Exhaust gases, Gases, Gas ionization, Ions, Energy, Recombination reactions, Electrons, Ionization, Plasma physics, Bibliography, Ionization potentials, Ion rockets, Ionization.

Aspects of the feasibility of harnessing the energy of the ions contained in the exhaust gases of rockets and missiles are considered. The Saha Equation was found to yield good results to an order of a magnitude. The necessity of undertaking a supplementary experimental program is outlined. The selection and description of suitable laboratory experimental apparatus is covered along with the scope of the experimental program. A thorough study of the best available diagnostic techniques to use for ionized gases was completed. The best suited approach appears to be the microwave interferometer. The theory and equipment requirement are presented. A complete bibliography is included. (Author) (See also PB 149 568)

PB 155 916 $2.60

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
UNSTEADY BOUNDARY-LAYER AND HEAT-TRANSFER PHENOMENA: A LITERATURE SURVEY, by Robert S. Wick. Progress rept. no. 20-279 on Contract DA 04-495-ORD-18. 15 Aug 55, 27p. 49 refs.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Boundary layer, *Heat transfer, Bibliography, Jet propulsion, Combustion, Stability, Fluid flow.

Many difficult problems in combustion stability have been encountered in high-performance propulsion systems such as rockets, ramjets, and turbojets. The nature of the phenomena involved in the unstable combustion often encountered in these propulsion systems is far from being fully understood. However, investigation of unstable combustion has shown that unsteady fluid-flow, heat-transfer, and mass-flow phenomena play an important role in unstable combustion. The purpose of this report is to review the existing knowledge of unsteady fluid flow and heat transfer in regions where viscous effects are important. The exclusion of unsteady phenomena such as unsteady hydraulics and inviscid aerodynamics limits the discussion to cases where boundary phenomena are important and to situations which are likely to be of most concern in understanding unstable combustion and in developing heat-exchange equipment which operates under unsteady flow conditions. Emphasis has been placed on phenomena which are periodic in nature. (Author)

Manufacturing Equipment and Processes

PB 155 713 $8.60

[Cornell U., Ithaca, N. Y.]
HIGH ENERGY RATE METAL WORKING BIBLIOGRAPHY, by Daniel E. Strohecker, John Shuler, and Hugh D. Hanes. Interim rept. no. 1, 1 Jan-30 June 60 [on Contract DA 30-115-ORD-241]. [1960] 97p. 152 refs. ORD-241.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Explosive forming, *Metals, Machining, Welding, *Energy, Sources, *Explosives, Manufacturing methods, Bibliography, *Forging.

The references have been assembled into groups according to the main topic of the reference. Cross indexing of the references is used when the reference deals with more than one subject. The major subjects included in the bibliography are: safety; energy sources; energy transfer mediums; facilities and equipment; high energy rate forming; high energy rate machining; theory of high energy rate phenomenon; high energy rate welding; work hardening by high energy rate methods; and high energy rate powder compaction.

SCTM-79-61(75) $0.50

Sandia Corp., Albuquerque, N. Mex.
A PROCEDURE FOR SCHEDULING SUPPLIER SURVEYS, by D. L. Field. Mar 61, 9p.

MATERIALS

PB 171 476 $2.50

Aeronautical Research Lab., Air Force Research Div., Wright-Patterson AFB, Ohio.
ON THE EVALUATION OF STRONGLY ENLARGED PHOTOGRAPHS, by Karl G. Guderley and Mary D. Lum. Feb 61, 112p. ARL Technical rept. 60-275.

DESCRIPTORS: *Photographic plates, Analysis, Electronic scanners, Probability, *Photographic enlargers, *Photographs, Light.

The accuracy of the evaluation of a photographic plate is limited by its grain structure. One approximates the value for the light density at a given point by the average light density in a small area (the "test area") surrounding the point. This paper establishes confidence limits for evaluation procedures of this kind. It is assumed that the grains on the photographic plate arise in independent random processes controlled by the local density of the light flux. In the evaluation procedure one counts the number of grains in the test area. Generalizing the method one attaches to each grain a weight factor depending upon the grain position within the test area and then determines the sum of the weight factors for the grains found in the test area. By such a procedure one can determine quantities related to the light density, e. g. the density gradient; one also can scan for patterns of a special kind, e. g. a sudden jump of the light density. For measurements of this kind probability theory predicts the expected value and the variance in terms of the light density and the chosen weight function. There are two kinds of errors due to the randomness inherent in the process of grain generation. The variance due to errors of both kinds must be minimized. (Author)

PB 171 297 $1.75

Armour Research Foundation, Chicago, Ill.
METHODS AND PROCEDURES FOR THE COLLECTION, EVALUATION, AND CONSOLIDATION OF THERMOPHYSICAL PROPERTIES OF MATERIALS, by Alexander Goldsmith. Rept. for 1 July 57-31 Aug 60 on Materials Application, Contract AF 33(616)5212. Jan 61, 66p. WADD Technical rept. 60-812.

DESCRIPTORS: *Solids, Thermodynamics, Physical properties, *Materials, Classification.

Methods and routines for the collection, evaluation, and processing of published physical property data into handbook form are described in detail. Storage and retrieval of information is accomplished by the use of edge-notched, hand-sorted punched cards which are coded for the following indexes: author, year of publication, language, material, property, temperature range, test method, and accession number. A materials index is included that serves to classify materials in the categories of elements, alloys, ceramics, cermets, intermetallics, polymerics, and composites. (Author)

PB 171 287 $2.00

Bolt, Beranek and Newman, Inc., Cambridge, Mass.
DEVELOPMENT OF PACKAGING MATERIALS WITH CONSTANT RESTORING FORCE, by Karl S. Pearsons and Eric E. Ungar. Rept. for Jan 59-July 60 on Materials Application, Contract AF 33(616)6311. Dec 60, 71p. 5 refs. WADD Technical rept. 60-573.

DESCRIPTORS: *Packaging, Design, *Vibration isolators.

On the basis of brief theoretical analyses it is shown that packaging materials with constant restoring force characteristics can result in better vibration and shock isolation than materials with more nearly linear force-displacement behavior. Theoretical models of constant restoring force materials involving buckled linkages and columnar configurations are proposed and analyzed. Realizations of these models are discussed, and results of static and dynamic tests are presented for some experimental configurations. It is shown that the materials developed so far are capable of effecting considerable weight or volume savings over commonly used foams, particularly for packaging either very delicate or very massive items. (Author)

PB 171 280 $1.75

Lockheed Aircraft Corp., Sunnyvale, Calif.
THE PHOTOCHEMISTRY OF DYES, by Kenneth D. Carroll. May 59, 54p. 292 refs. Selective Bibliography SB 59-51; AD-237 118.

DESCRIPTORS: *Dyes, Photochemistry, Bibliography

The majority of entries are from Chemical Abstracts, 1926-1957. Items have been arranged alphabetically within chronological groups. (Author)

PB 171 793 $2.00

Naval Ordnance Lab., White Oak, Md.
ADAPTABILITY OF IRON-SILICON MAGNETIC ALLOYS FOR SPECIAL ENVIRONMENTS, by H. H. Helms, Jr. 26 Oct 60, 74p. 73 refs. NAVWEPS rept. 7331; AD-251 912.

DESCRIPTORS: *Magnetic alloys, Iron alloys, Silicon alloys, Physical properties, Magnetic properties, Temperature, Oxidation, Crystal structure, Stability, Radiation effects, Reliability, *Space environmental conditions.

This report presents in detail those intrinsic physical and magnetic properties of the iron-silicon alloy system (containing 0% to 6.5% silicon by weight) that make it particularly suitable for satisfying a majority of the new environmental demands. Numerous comparisons are made between these alloys and the many other existing "soft" magnetic alloys for purpose of illustrating the preference of one system over another for each particular environmental condition under consideration. Specific emphasis is placed on performance characteristics of iron-silicon alloys at operating temperatures up to 500°C, in nuclear radiation environments of $\sim 10^{17}$ fast neutrons/cm^2, and also in environments where effects of oxidation, compression, and special crystalline orientations can influence the stability and efficiency of these materials. (Author)

PB 171 785 $0.50

Technical Development Center [Federal Aviation Agency] Indianapolis, Ind.
THE INCREASE IN FIRE-RESISTANCE PROVIDED BY FIRE-RETARDANT COATING ON ALUMINUM AND MAGNESIUM SHEET, by Paul R. Dierdorf. Aug 58, 19p. Technical Development Rept. no. 360.

DESCRIPTORS: *Sheets, *Fire resistant coatings, Tests, Helicopters, Materials, Airplane panels, Aluminum, Magnesium, *Fire resistant paints, *Paints.

The results indicate that the Albi fire-retardant coatings increased the fire-resistance of the test panels to some degree, although all of the coated tests panels, with the exception of two, reached a temperature of 600°F. in less than one minute. Accordingly, it is recommended that materials such as aluminum and magnesium protected by the coatings tested should not be used to replace stainless steel or other materials in the engine compartment structure of aircraft where the use of fireproof materials is recommended.

Ceramics and Refractories

IS-267 $0.50

Ames Lab., Iowa State U. of Science and Tech.
URANIUM GLASSES III. URANIUM PHOSPHATE GLASSES, by C. D. Wirkus and D. R. Wilder. Rept. or Contract W-7405-eng-82. Feb 61, 23p.

PB 171 346 $2.25

New York State Coll. of Ceramics, Alfred U.
GRAIN SIZE EFFECTS ON THE THERMAL CONDUCTIVITY OF CERAMIC OXIDES, by J. R. Tinklepaugh, R. S. Truesdale and others. Rept. for 1 Nov 59-31 Oct 60 on Surface and Interface Phenomena of Matter, Contract AF 33(616)3798. Feb 61, 87p. 64 refs. ARL-5.

DESCRIPTORS: *Ceramic materials, Oxides, Aluminum compounds, Magnesium compounds, Grains (Metallurgy), Surface properties, Heat transfer, Conductivity.

Dense, fine grained alumina samples were employed in a study of the effect of grain size on thermal conductivity in polycrystalline alumina. The thermal conductivity in the temperature range from 100°C to 1000°C decreased slightly but significantly as the average grain size was varied from 10 to 4 to 2. The decrease in thermal conductivity with decreasing grain size was found to follow closely an additive reciprocal volume relationship, which has been discussed by several investigators. The role of impurities in masking this effect in dense alumina samples of purity exceeding 99% was shown by measuring the thermal conductivity of specimens with small variations in impurity content. The strength and modulus of elasticity of these fine grained aluminas were also measured. Several questions were raised concerning the data obtained which has not been resolved. Dense samples of MgO have also been produced using hot pressing techniques and strength and elasticity properties measured. These results are incomplete and not well understood. (Author)

Fuels, Lubricants, and Hydraulic Fluids

PB 155 706 $1.10

AeroChem Research Labs., Inc., Princeton, N. J.
STUDY OF ADDITIVE EFFECTS IN SOLID PROPELLANT BURNING, by Herman Burwasser. Quarterly progress rept. no. 2 on Contract Nonr-2806(00). Oct 59, 10p. 5 refs. AeroChem TM-17; AD-227 507.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Solid rocket propellants, *Combustion, *Fuel additives, Flames, Effectiveness, Gases, Inhibition, Ammonium compounds, Perchlorates, Esters, Polymers.

Screening experiments of gaseous environmental influence on composite solid propellant burning have been extended to include the effects of twenty-two gases on ammonium perchlorate - polyester propellants. Of the twenty-two gases to date, only seven have been used with uninhibited or non-restricted strands. Only oxidizing gases were found to have any appreciable effect, namely, air, chlorine, nitrous oxide and oxygen. All increased burning rates in the above order - oxygen by a factor of 10; hydrogen, helium and hydrogen bromide effects were absent. A minimum of three runs were

made with each gas at a pressure of one atmosphere. A facility for preparing small batches of propellant has been completed and is in operation. Two batches of uncured propellant have been prepared and burned. The results indicate that the method, with further improvement in technique, should yield reproducible and reliable data. (Author)

LA-2510 $1.25

Los Alamos Scientific Lab., N. Mex.
PROPERTIES OF SOME PROPELLANT FLUIDS CONTAINING HYDROGEN, by Don L. Bunker. Rept. on Contract W-7405-eng-36. 31 Dec 60, 51p.

PB 154 278 $14.50

Princeton U., N. J.
LIGHT SCATTERING AND TRANSMISSION PROPERTIES OF SPRAYS, by Richard A. Dobbins. Technical rept. on Contract AF 18(600)1527. 23 Nov 60, 217p. 38 refs. Aeronautical Engineering Lab. rept. no. 530; AFOSR-17; AD-249 940.

DESCRIPTORS: Light, Scattering, Sprays, *Combustion, Particles, Stability, *Optical analysis, Atomization, *Rocket motors, Light transmission, Spheres, Measurement.

Diffuse transmission properties were examined. These properties were large compared to the wavelength of light and were described by a theory that considers the attenuation of incident light and the generation and attenuation of primary scattered light. The theory predicts that the angular variation of the diffractively scattered light is a function only of particle size distribution. A second prediction is that the diffractive scattering causes an augmentation of the light received in the forward direction. The predictions of the theory are verified experimentally. In addition, specular transmission experiments verify: (1) the applicability of the transmission law to a polydispersion of particles large compared to the incident radiation; and (2) the theoretical prediction of Mie and diffraction theories that the scattering area of a large particle is twice its geometric cross section. The feasibility of determining the particle size distribution of polydispersions whose particle diameters are distributed according to the Upper Limit Function is investigated. It is concluded that the angular variation of intensity of scattered light is not sufficiently sensitive to permit a unique determination of the shape parameters of the distribution function. However, it is found that for all useful values of the shape parameters, the scattered light profiles can be correlated to a high degree of accuracy on the basis of volume-to-surface mean diameter. (Author)

Leather and Textiles

PB 153 958 $2.60

Institute of Polymer Research, Polytechnic Inst. of Brooklyn, N. Y.
IMPROVEMENT OF THERMAL STABILITY OF TEXTILE FIBERS, by F. R. Eirich, I. Saad and others. Progress rept. no. 12, for 1 Apr-30 June 59 Final rept. 1 July 56-30 June 59, on Contract N140(132)57745B. [1959] 27p. AD-249 739.

DESCRIPTORS: *Textiles, *Fibers, Stability, Temperature, Polymers, Melting, Resistance, *Nylon, *Coatings, *Fire resistant coatings, *Fire resistant textiles, Acrylonitriles, *Dacron, Ultraviolet radiation.

A considerable number of flameproofing, cross-linking, and coating agents were tried and screened and their effect tested by a simple melting-point type apparatus. The most satisfactory results were obtained by coating nylon fibers with a thin sheath of polyacrylonitrile. Among many coating methods, two were found superior and potentially capable of practical application. According to the first method, the fibers are soaked with a solution of a free radical initiator and exposed to acrylonitrile vapor. Coatings of 10 - 15% by weight of polyacrylonitrile can be readily produced in a few minutes which are sufficient to make the fabrics shrink and carbonize rather than melt. The second method employs UV light to superficially attack the nylon fibers; this can be done without damage to them. Exposing the activated fibers again to acrylonitrile vapor leads to another coating by polyacrylonitrile, this time chemically anchored, which cannot be removed by extraction. Coating weight of 10%, too, are in this case sufficient to melt proof and can be applied within approximately 10 minutes. (Author) (See also PB143086)

NCSC-2477-1 $2.50

North Carolina State Coll. of Agriculture and Engineering, Raleigh.
APPLICATIONS OF NUCLEAR RADIATION AND RADIOSOTOPES TO TEXTILE MATERIALS AND PROCESSES, by Arthur A. Armstrong, Jr. and Henry A. Rutherford. Annual rept. 1 Nov 59-1 Nov 60, on Contract AT-(40-1)-2477. 1 Nov 60, 72p.

Plastics

PB 171 615 $2.25

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
CONTROLLED BRANCHING OF FOAM RESIN POLYMERS SYNTHESIZED FOR PRECISION RADOMES, by H. R. Moore. Final rept. on TED Proj. no. ADC AV-44006.1. 22 Nov 60, 85p. 46 refs. Rept. no. NADC-EL-5942; AD-250 744.

DESCRIPTORS: Polymers, Foams, *Resins, *Radomes, Urethanes, Condensation reactions, Synthesis, *Alkyd resins, *Expanded plastics, Stereochemistry, Materials, Aircraft, *Fighters, Effectiveness, Preparation, Polymerization, Sandwich construction.

Branching theory of condensation polymers was applied advantageously in the selection of branching alcohols, branching reducers, and dibasic acids; and in optimizing starting functional group ratios and degree of esterification of carboxyl groups in the production of saturated, partially esterified, alkyd foam resin composition of improved diisocyanate cross linking capacity. Several resins converted to rigid urethane foams by preferred temperature controlled processes described in a previous report gave improvements of the order of 10 to 15 percent in compression, 15 to 30 percent in shear, and 20 to 75 percent in tensile over the control resin, Selectron 5922, currently approved by Specifications No. MIL-C-8087A(USAF) and MIL-S-25392(USAF). (Author)

PB 171 797 $0.50

Naval Ordnance Lab., White Oak, Md.
ELECTRO-THERMAL ANALYSIS OF THERMOSETTING POLYMERS, by R. W. Warfield. 15 Oct 60, 16p. 25 refs. NAVWEPS rept. 7358; AD-253 518.

DESCRIPTORS: *Thermosetting resins, Analysis, Pyrolysis, Resistance, Stability, Deterioration, *Plastics, *Polymers.

The thermal stability of three typical thermosetting polymers has been determined by a new experimental technique. This technique, which is called Electro-Thermal Analysis (ETA), consists of determining the magnitude and temperature dependence of the electrical volume resistivity of a polymer before and after thermal degradation. Onset of degradation is evidenced by a decrease in the maximum values of the magnitude and temperature dependence of the resistivity. Complete degradation is indicated when the electrical parameters approach limiting values characteristic of the basic structure of the polymer. The ETA results are discussed in terms of the structure of the polymers considered. These results indicate that resistivity techniques are sensitive to the degradation of bulk thermosetting polymers. (Author)

PB 171 036 $2.75

Plastics Technical Evaluation Center, Picatinny Arsenal, Dover, N. J.
TECHNICAL RESOURCES DIRECTORY IN PLASTICS, by Harry L. Comins. Jan 61, 147p. 512 refs. PLASTIC rept. 5.

This report released for sale to the public 19 May 61.

DESCRIPTORS: *Plastics, *Scientific personnel, Air force research, Army department, Naval research, Ordnance, *Engineering personnel, *Directories.

The survey of technical resources, upon which the information contained in this directory is based, has attempted to reach all Army, Navy, and Air Force military installation doing work in plastics. In the "Subject" column appears a detailed breakdown of the activities of each installation, including better than fifty subdivisions of the entire field. In addition, end items of interest to military installations are given. In the column headed "Source (agency and individual)" appear the names of the engineers engaged in developing and/or manufacturing the plastics items listed in the subject column. The name, address, and telephone number of each installation, as well as the telephone extension number of each individual are also listed. An alphabetically arranged subject index enables the reader to locate the page on which appear the subject of his interest, the military installation in which the activity is carried on, and the personnel that conduct the activity.

MATHEMATICS

PB 153 960-2 $26.00

Air Force [Cambridge Research Labs.] Bedford, Mass.
TABLES OF $-P \log_2 P - Q \log_2 Q$, VOLUME II, PART 3 (SECTION 1). DIRECT TABLES, $-\log_2 P$, $-P \log_2 P$, $-P \log_2 P - Q \log_2 Q$, $-\log_2 Q$ P: 0(.00001). 24999, by J. Mott-Smith and H. M. Willett. July 60, 504p. 1 ref. ERD-TN-60-778(II); AD-249 596.

DESCRIPTORS: *Functions, Tables, Information theory, Physics.

PB 153 960-3 $26.00

Air Force [Cambridge Research Labs.] Bedford, Mass.
TABLES OF $-P \log_2 P - Q \log_2 Q$, VOLUME III. PART 3 (SECTION 2). DIRECT TABLES, $-\log_2 P$, $-P \log_2 P$, $-P \log_2 P - Q \log_2 Q$, $-Q \log_2 Q$, $-\log_2 Q$, by J. Mott-Smith and H. M. Willett. July 60, 504p. ERD TN-60-778(III); AD-249 597.

DESCRIPTORS: *Functions, Tables, Information theory, Physics.

PB 147 171 $8.10

Applied Mathematics and Statistics Labs., Stanford U., Calif.
THEORY AND APPLICATIONS OF THE SEQUENTIAL DESIGN OF EXPERIMENTS, k-ACTIONS AND INFINITELY MANY EXPERIMENTS. PART II. APPLICATIONS, by Stuart A. Bessler. Technical rept. no. 56 on Contract N6onr-25140, 5 Apr 60, 82p. 2 refs. AD-236 112.

DESCRIPTORS: Experimental data, Statistical analysis, *Sequential analysis, Sampling.

The results of Part I (PB 153 688) are applied to six examples: (1) a design for recognizing the unique coin in a group of k otherwise identical coins, (2) the problem of checking the reliability of a two component system, (3) and (4) a design for identifying several known but untagged populations, and (5) and (6) a design for determining which of three populations has the greatest mean. (Author)

PB 154 558 $2.60

Bolt Beranek and Newman, Inc., Cambridge, Mass.
TRANSFORMATION RULES AND PROGRAM SIMPLIFICATION, by T. G. Evans and Thomas Marill. Scientific rept. no. 3 on Contract AF 19(604)7290. 7 Feb 61, 27p. Rept. no. 784; AFCRL-TN-61-113; AD-251 083.

DESCRIPTORS: *Programming, *Transformations (Mathematics), Functions, Theory.

Consideration was given to an approach to the problem of program simplification. The essential idea is to perform manipulations, through a set of transformation rules, on a given class of function-representing expressions (which we call F-expressions), thereby producing equivalent F-expressions from which "better" programs may be generated. The first part of the report defines the F-expressions and discusses in general terms the process of using transformation rules to perform a systematic search for the "best" F-expression equivalent to the given one. The remainder of the report is devoted to an application of this scheme to one special class of problems. An advantageous procedure for converting F-expressions to programs is discussed, and a set of examples illustrative of the computational savings possible through the use of this scheme is given. (Author)

PB 154 575 $6.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
SPECTRAL ESTIMATES AND THEIR DISTRIBUTIONS, by R. H. Jones. Technical rept. no. 10 on Contract DA 36-039-sc-78130. Dec 60, 66p. 27 refs. DA-SC-78130/10; AD-248 617.

DESCRIPTORS: Experimental data, Series, Real variables, Statistical analysis, Measure theory, *Statistical distributions, Probability, *Statistical processes.

Methods of choosing spectral windows for estimating the spectral density of a stationary time series are discussed, and a generalization of the hanning and hamming spectral windows presented. By using the concept of spectral window band-width, optimal discrete spectral windows are derived. Spectral estimates are given for stochastic processes, the time points of which are chosen using an additive random scheme. A method is suggested for handling any unequally spaced data. When estimating the two-dimensional spectral density of a harmonizable stochastic process (non-stationary), nothing is seen gained by smoothing the periodograms. Also, a test for stationarity of a periodic harmonizable stochastic process is given. Two methods are presented for the numerical calculation of the frequency function of a quadratic form in normal variates. A modified Laguerre series using a Type III approximation as its weight is used when the eigenvalues of the matrix are non-negative and closely grouped. The second method, useful for any real eigenvalues, uses the saddle point approximation and method of steepest descent to invert the characteristic function. An asymptotic expression, which can be used to obtain an upper confidence limit of an estimate is given for the frequency function for large values of the argument. (Author)

PB 147 555 $7.60

Institute of Mathematical Sciences, New York U., N. Y.
A UNIFIED THEORY OF ESTIMATION. I, by Allan Birnbaum. Rept. on Contract Nonr-285(38). Rev. and extended Apr 60, 80p. 27 refs. IMM-NYU-266; rev. of CU-22-59; AD-236 784.

DESCRIPTORS: *Statistical analysis, Probability.

Previous formulations and theories of estimation for one-parameter problems are extended. The basic criterion used is admissibility of a point estimator, defined with reference to its full distribution rather than special loss functions such as squared error. Theoretical methods of characterizing admissible estimators are given, and practical computational methods for their use are illustrated in a variety of examples. Point, confidence limit, and confidence interval estimation are included in a single theoretical formulation, and incorporated into estimators of an "omnibus" form called "confidence curves." The usefulness of the latter for some applications as well as theoretical purposes is illustrated. Fisher's maximum likelihood principle of estimation is generalized, given exact (non-asymptotic) justification, and unified with the theory of test and confidence regions of Neyman and Pearson. Relations between exact and asymptotic results are discussed. An application of the general theory gives optimal sequential estimators having prescribed precision in a specified interval. (Author)

PB 154 604 $1.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
ASYMPTOTIC DEVELOPMENTS III: AGAIN ON THE FUNDAMENTAL THEOREM OF ASYMPTOTIC SERIES, by J. G. Van der Corput. Rept. on Mathematics, National Science Foundation Grant G 5228. July 60, 17p. 2 refs. LMSD-703064; AD-246 046.

DESCRIPTORS: *Series, Complex variables, Real variables, Functions.

The fundamental theorem on asymptotics series can be formulated as follows: A series $a_0 + a_1 + \ldots$ converges asymptotically if and only if a_h tends asymptotically to zero as h approaches infinity. An application of this theorem and the generalization of a finite number of real variables, instead of one variable ω, is also given.

PB 154 598 $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
INTRODUCTION TO THE RESIDUE CALCULUS, by J. G. van der Corput. Technical rept. on Mathematics. July 60, 26p. 7 refs. LMSD-703063; AD-246 116.

DESCRIPTORS: *Complex variables, Functions, Algebra, Integral equations, Theory.

Open-ended Terms: Residue calculus.

In the theory of complex variables, the integral of an analytic function along a closed contour is under general conditions equal to an elementary factor times the sum of the corresponding residues. The neutrix calculus gives a generalization of this result where the integration domain may be an interval, a contour (closed or not), a region lying in the n dimensional space, an m-dimensional surface lying in an n-dimensional space, etc. Under general conditions, such an integral is equal to the sum of the residues of the integrand at the critical points. The residue at a critical point is uniquely defined by the behavior of the integrand and of the integration domain in the neighborhood of that point. These residues are determined by means of neutrices. A number of examples is presented. Particularly important is the residue calculus in asymptotics where the asymptotic behavior of functions is determined for large absolute values of a certain unbounded variable w. Under certain general conditions, an integral depending on w is asymptotically equal to the sum of the corresponding asymptotic residues. As illustration, the asymptotic behavior of a two-dimensional integral with rapidly oscillating integrand is determined, where the methods known up till now are useless, since the phase of the integral is constant on a part of the boundary of the integration domain. (Author)

LA-2520 $2.00

Los Alamos Scientific Lab., N. Mex.
ON THE DETERMINATION OF SAMPLE SIZE, by A. Goldman. Rept. on Contract W-7405-eng-36. Feb 61, 77p.

SCTM 178-59(51) $1.25

Sandia Corp., Albuquerque, N.Mex.
A FORMULA FOR DETERMINING SAMPLE SIZE IN HYPERGEOMETRIC SAMPLING WHEN ZERO DEFECTIVES ARE OBSERVED IN THE SAMPLE, by D. B. Owen, E. J. Gilbert and others. 3 June 59, reprinted 2 Mar 61, 47p.

PB 171 776 $1.00

Stanford U., Calif.
THE CLASSIFICATION OF DIFFERENTIAL OPERATORS, by George Hufford. Rept. on The Generation, Propagation, Action, and Control of Acoustic Energy, Contract AF 33(616)2987. Dec 60, 34p. 6 refs. WADD Technical note 60-103.

DESCRIPTORS: *Operators (Mathematics), Classification, Matrix algebra, Polynomials.

This technical note contains two parts. The first part consists of a survey of the more important and frequently used definitions of the types of scalar and matrix equations, that is, notions of ellipticity, parabolicity and hyperbolicity. The second part reviews these definitions in the light of the fundamental solution matrix, and deduces a number of important properties of the principal parts of such matrices. (Author)

PB 171 284 $0.75

Stanford U., Calif.
SOME APPLICATIONS OF THE WIENER-HOPF TECHNIQUE, by Dale W. Swann. Rept. on The Generation, Propagation, Action, and Control of Acoustic Energy, Contract AF 33(616)2987. Dec 60, 28p. 6 refs. WADD Technical rept. 60-231.

DESCRIPTORS: *Integral equations, Integral transforms, Theory.

A system of two singular integral equations of the first kind of Wiener-Hopf type is attacked by introducing generalized Fourier transforms, and a system of equations in the transforms is obtained which holds for almost all real values of the transform variable. A theorem shows that the transforms of the unknown functions are actually analytic in the transform plane, with predictable singularities. Two conditions on the transforms of the kernels are deduced which characterize the multivalued behavior of the transforms of the unknowns near the origin. The method is applied to a system of integral equations similar to that which arises in a consideration of the flow of a viscous, compressible, heat conducting fluid across a heated flat plate, but much simplified. (Author)

PB 154 049 $1.10

Visibility Lab., U. of California, San Diego.
EXTRACTION AND EXTENSION OF MATRICES IN COMPUTER CALCULATIONS, by William Hadley Richardson. Rept. on Contract NObs-72092. June 60, 7p. SIO Ref. 60-43; AD-251 824.

DESCRIPTORS: Matrix algebra, Mathematical computer data

The problems involved are: The extraction of a submatrix from a matrix; and the extension of a matrix to a matrix of larger dimensions with the original matrix as a given submatrix of the larger and the rest of the larger matrix composed of zero submatrices.

Computing Devices

ANL-6319 $1.25

Argonne National Lab., Ill.
ENGINEERING APPLICATIONS OF ANALOG COMPUTERS, by Lawrence T. Bryant, Marion J. Janicke and others. Rept. on Contract W-31-109-eng-38. Feb 61, 48p.

WAPD-TM-233 $1.50

Bettis Atomic Power Lab., Pittsburgh, Pa.
THE BKS SYSTEM FOR THE PHILCO-2000 COMPUTER, by R. B. Smith and C. H. Hunter. Rept. on Contract AT-11-1-GEN-14. Apr 61, 64p.

WAPD-TM-229 $2.00

Bettis Atomic Power Lab., Pittsburgh, Pa.
TRAC-1. A MONTE CARLO PHILCO-2000 PROGRAM FOR THE CALCULATION OF NEUTRON CAPTURE PROBABILITIES, by H. J. Berwind and J. Spanier. Rept. on Contract AT-11-1-GEN-14. Mar 61, 41p.

APEX-585 $2.00

General Electric Co., Cincinnati, Ohio.
RUNAWAY ANALYSIS FOR A GAS-COOLED REACTOR, by R. A. Becker. Rept. on Contracts AF 33(600)-38062 and AT(11-1)-171. Apr 61, 89p.

KAPL-2086 $1.50

Knolls Atomic Power Lab., Schenectady, N. Y.
FLEER: A TWO-DIMENSIONAL TRIANGULAR MESH DIFFUSION PROGRAM FOR THE IBM 704, by J. L. Fletcher, J. P. Jewett, and E. D. Reilly, Jr. Rept. on Contract W-31-109-eng-52. 6 May 60, 60p.

PB 154 571 $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
AN APPROACH TO PATTERN RECOGNITION USING LINEAR THRESHOLD DEVICES, by R. L. Mattson. Technical rept. on Mathematics. Sep 60, 31p. 8 refs. LMSD-702680; AD-246 244.

DESCRIPTORS: *Mathematical computer data, Classification, *Data processing systems, Simulation, *Programming, Digital computers, Magnetic cores, Materials, *Reading machines.

The general problem of pattern recognition is represented as a mapping between three fundamental spaces A pattern space, consisting of the patterns of interest; a data space, consisting of measurements made on the patterns; and a classification space, consisting of the various classes of patterns to be recognized. The mapping from pattern space to data space is accomplished by equipment which measures characteristics of the patterns of interest which have utility for the system. Three examples are presented to illustrate the way in which this initial processing might be accomplished. An automatic design procedure is presented for a binary classification system capable of mapping from the data space into a recognition class in the classification space. The binary classification system uses networks of linear threshold devices to perform this mapping. These networks are easily designed by a high-speed digital computer, and the time and storage requirements are small enough to make the procedure attractive for a wide variety of pattern recognition problems. The networks can be constructed by using magnetic core materials, or simulated by using a special-purpose digital computer. If the initial data processing of the patterns of interest isolates a set of characteristics which can be effectively used, the rest of the pattern recognition problem becomes fully automatic. (Author)

K-1472 $0.50

Union Carbide Nuclear Co., Oak Ridge, Tenn.
CRITICAL PATH SCHEDULING IN MAINTENANCE, by C. L. Gritzner, J. P. Jones, and J. M. Ellis. Rept. on Contract W-7405-eng-26. 10 Apr 61, 26p.

MECHANICS

PB 154 144 $1.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
AN ANALOGUE OF THE SPHERICAL HARMONICS FOR THE EQUATIONS OF ELASTICITY, by J. H. Bramble and L. E. Payne. Rept. on Contract AF 49(638)228. Nov 60, 18p. 7 refs. Technical note BN-222; AFOSR-6; AD-249 359.

DESCRIPTORS: *Elasticity, Mathematical analysis, Vector analysis, Partial differential equations, Numerical methods and procedures, Spheres.

For the interior of an elastic sphere, a set of solutions is obtained of the displacement equations of classical elasticity which form a complete orthogonal system of vectors on the surface of the sphere. These functions should prove useful in approximating solutions of boundary value problems in elasticity. (Author)

PB 154 143 $1.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
NEW MEAN VALUE THEOREMS IN ELASTICITY, by J. B. Diaz and L. E. Payne. Rept. on Contract AF 49(638)228. Nov 60, 16p. 10 refs. Technical note BN-210; AFOSR-5; AD-249 358.

DESCRIPTORS: *Elasticity, Mathematical analysis, Stresses, Spheres.

Three mean value theorems in the theory of elasticity are derived. The first two express the stress components at the center of a sphere in terms of (1) the normal surface displacement and the tangential surface tractions, and (2) the tangential surface displacement and the normal component of the surface traction. The third mean value theorem expresses the components of the stress deviator tensor in terms of the tangential displacements and the tangential surface tractions. (Author)

PB 153 967 $2.60

Springfield Armory, Mass.
STRESS ADVANTAGE OF NESTED SPRINGS, by H. P. Swieskowski. 22 Aug 60, 23p. 1 ref. SA-TR15-1103; AD-249 686.

DESCRIPTORS: *Springs, *Stresses, Mathematical analysis.

A mathematical study of the characteristics of nested springs was made. The advantage of the use of nested springs in comparison with a single spring is shown by a reduction in stress for equivalent conditions of loading. Detailed derivations are shown and the results discussed. (Author)

Aerodynamics and Pneumatics

PB 154 242 $10.50

Army Transportation Research Command, Fort Eustis, Va.
VTOL AIRCRAFT DOWNWASH IMPINGEMENT SYMPOSIUM, A COMPILATION OF THE PAPERS PRESENTED. 15 DECEMBER 1960. [1960] 136p. 8 refs. TREC Technical rept. 61-1; AD-249 420.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Short take-off planes, *Naval research, *Vertical take-off planes, Ground effect, Aircraft, *Downwash, *Military research, *Aerodynamics, *Scientific research, *Symposia, *Jet planes, Blast, *Helicopters.

Contents:
Tactical Aspects of Downwash
Navy Presentation
Army Research in Downwash Problems
Downwash and Recirculation Studies
Proposed Investigation of VTOL Downwash Blast Effects
Navy Research in Downwash Problems
NASA Research on Downwash Impingement
Particle Movement and Velocity Survey Tests Conducted by Hiller Aircraft with Various VTOL and GEM Propulsion Devices
Kellett Full-Scale Downwash Impingement Experimental Investigation
Factors Influencing Ground Particle Entrainment
Model and Full-Scale Test of Ground Impingement of a Jet VTOL
Downwash: Some Experimental Results and Operational Experiences
Simulated VTOL Exhaust Impingement on Ground Surfaces
V/STOL Impingement Tests on Ducted Propellers and Turbojets

PB 154 712 $8.10
Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
SHOCK-TUNNEL STUDIES OF HYPERSONIC, FLAT-PLATE AIRFLOWS, by J. Gordon Hall and T. C. Golian. Rept. on Contract AF 18(603)10. Dec 60, 83p. 26 refs. Rept. no. AD-1052-A-10; AFOSR-TR-60-142; AD-251 084.

DESCRIPTORS: *Hypersonic flow, Boundary layer, *Sheets, *Heat transfer, Pressure, Hypersonic wind tunnels, Schlieren photography.

The effects of boundary-layer displacement and leading-edge bluntness on the inviscid and viscous characteristics of hypersonic airflow over flat plates have been investigated in the shock tunnel for low values of wall-to-stagnation temperature ratio. The primary interest of the work was in the fluid dynamic phenomena concerned; real gas effects were essentially absent.

PB 171 259 $1.00

David Taylor Model Basin, Washington, D. C.
GROUND EFFECT MACHINE RESEARCH AND DEVELOPMENT IN THE UNITED STATES, by Harvey R. Chaplin. Dec 60, 35p. 1 ref. Aero rept. 994; Rept. 1463; AD-249 707.

DESCRIPTORS: *Ground effect, *Aircraft, *Aerodynamics, *Fluid mechanics, Mathematical analysis, Naval research, *Hydrodynamics, Lift, Drag.

Open-ended Terms: Ground effect machine.

Basic ground cushion concepts are reviewed in terms of elementary principles of fluid mechanics: (1) air curtain, annular jet, or peripheral jet, (2) air curtain with skegs, (3) integrated air curtain, (4) water curtain, (5) plenum, (6) ram wings, and (7) diffuser-recirculation system. Illustrative comparisons are given. Insufficient experimental data exist to permit a realistic assessment of any but the air curtain concept. GEM's role in transportation is discussed. (Author)

PB 155 714 $2.60

General Electric Co., Schenectady, N. Y.
THEORETICAL EVALUATION OF THE TURBULENT SKIN FRICTION AND HEAT TRANSFER ON A CONE IN SUPERSONIC FLIGHT, by C. Gasley. Rept. on Project Hermes [Contract DA 30-115-ORD-23]. Nov 49, declassified 12 June 50, 30p. 21 refs. Technical Information Series R49A0524.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Bodies of revolution, *Conical bodies, *Heat transfer, *Turbulent boundary layer, Supersonics, *Supersonic flight.

Expressions are derived for the skin friction and heat-transfer rates in a turbulent boundary layer on a cone in supersonic flow. The skin friction is obtained by evaluating the rate of change of momentum within the boundary layer, and the heat transfer rate by the heat-momentum transfer analogy. The effects of compressibility are accounted for by a tentative procedure. (Author)

PB 148 529 $7.60
Institue of Engineering Research, U. of California, Berkeley.
AERODYNAMIC CHARACTERISTICS OF WEDGES IN LOW DENSITY SUPERSONIC FLOW, by S. A. Schaaf, E. S. Moulic and others. Rept. on Contract Nonr-222(45). 8 Apr 60, 71p. 8 refs. Technical rept. HE-150-180; Series no. 125, issue no. 3; AD-238 637.

DESCRIPTORS: *Airfoils, Aerodynamics, Wind tunnel models, Theory, Reynolds number, *Boundary layer, *Supersonic flow, *Wedges, Lift, Drag.

Experimental measurements of the lift, drag and pitching moment coefficients of wedge-shaped airfoils are presented. The experiments were carried out for 5^{o} and 30^{o} half-angle sharp leading edge wedges at Mach numbers of 4 and 6 and with Reynolds numbers in the range of 1500 to 8900. The results exhibited steady viscous effects, particularly for the slender wedges, and were in reasonably good agreement with a simplified form of "weak interaction" boundary layer theory for a perfect gas. An extension of this theory indicates the probable importance of heat transfer effects on viscous aerodynamic characteristics. (Author)

PB 154 434 $11.50

Naval Weapons Lab., Dahlgren, Va.
NUMERICAL CONSTRUCTION OF TRANSONIC FLOWS PAST BLUNT BODIES OF REVOLUTION, by E. W. Schwiderski and E. L. Poole. 11 Jan 61, 158p. 2 refs. NWL rept. no. 1695; AD-250 708.

DESCRIPTORS: *Digital computers, Gas flow, Blunt bodies, Bodies of revolution, *Transonic flow, Re-entry aerodynamics, Partial differential equations, Shock waves, Programming.

A detailed description, including flow diagrams, is given for constructing transonic flow elements by the method of generalized grid schemes and generalized finite differences. The computing program allows for the influence of real gas effects across the shock wave and for the specification of free stream Mach numbers ranging from 1.2 up. The shock wave is prescribed as the arc of an ellipse, hyperbola, or parabola with allowances for the perturbing effects of fourth degree algebraic terms. The average NORC computing time per case is fifty seconds. Forty-one different cases are given in tabular and/or graphical form. Comparisons with some of Van Dyke's results are shown. (Author)

PB 171 286 $2.75

Polytechnic Inst., of Brooklyn, N. Y.
THE HOMOGENEOUS BOUNDARY LAYER AT AN AXISYMMETRIC STAGNATION POINT WITH LARGE RATES OF INJECTION, by Paul A. Libby. Rept. for Aug 59-Aug 60 on Experimental Technique for Materials Research, Contract AF 33(616)5944. Dec 60, 138p. 29 refs. WADD Technical rept. 60-435.

DESCRIPTORS: *Laminar boundary layer, Mathematical analysis, Fluid flow, *Heat transfer, *Boundary layer control, *Aerodynamic heating.

This report presents a theoretical analysis of the boundary layer at an axisymmetric stagnation point with large rates of air injection. The results of a previous investigation indicated that for localized mass transfer in the stagnation region the rates of injection are considerably greater than those usually treated. The exact stagnation point boundary layer equations are integrated numerically for an approximate representation of the gas properties. The two point boundary conditions are treated in a new manner which is useful for various boundary layer and mixing problems. The exact solutions indicate that for large rates of injection the boundary layer is closely represented by an inner isothermal shear flow and by an exterior relatively thin region in which the flow variables change to their free-stream values. An integral method based on profiles suggested by the exact solutions is developed and shown to lead to accurate predictions of the integral thicknesses which are of interest for a study of the downstream influence of the stagnation point mass transfer. (Author)

Hydrodynamics, Hydraulics, and Hydrostatics

PB 154 539 $3.60

Aeronautical Materials Lab., Naval Air Material Center, Philadelphia, Pa.
THE DEVELOPMENT OF A SUITABLE TEST PROCEDURE TO DETERMINE FILTRATION EFFICIENCY FOR AN6235 LINE TYPE ELEMENTS, by C. E. McCreary. 2 Mar 55, 37p. 13 refs. Rept. no. AML NAM AE 6230.1.

DESCRIPTORS: *Hydraulic fluid filters, Test methods, Aircraft equipment.

Open-ended Terms: AN6235

PB 147 405 $4.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
THE COLLAPSE OF A SPHERICAL CAVITY IN A COMPRESSIBLE LIQUID, by R. S. Brand. Technical rept. no. 34 on Contract Nonr-562(07). Apr 60, 47p. 22 refs. 562(07)/34; AD-236 582.

DESCRIPTORS: *Cavitation, Spheres, Fluid mechanics, Partial differential equations, Bubbles, Pressure, Velocity, Water, Mathematical analysis, Equations.

The pressure and velocity fields surrounding a collapsing spherical cavity in water are calculated. Two distinct solutions are displayed; a numerical finite-difference solution of the equations of spherically symmetric motion of a compressible fluid in Eulerian co-ordinates, and an approximate analytical solution of the equation for spherical waves in Lagrangian co-ordinates. The analytical solution contains the essential features of the velocity field as calculated numerically, including a fairly accurate prediction of the cavity wall motion. (Author)

PB 171 724 $0.50

Bureau of Naval Weapons, Washington, D. C.
FLUID PRESSURE 35 TO 20,000 PSIG. BuWeps-BuShips Calibration Program. 16 May 60, 18p. Secondary Standards Lab. Measurement System Operation Procedure NP-01.

DESCRIPTORS: *Pressure gages, *Calibration, Fluids, Hydraulic fluids, *Pressure, Measurement, Hydraulic systems, Instruction manuals, *Instrumentation.

The basic system is comprised of the Standard, interconnecting hydraulic lines, and fittings. Sufficient pressure to float the Standard piston and mass load is introduced into the system by means of a pressure generator and hydraulically transmitted to the Test Instrument; then the pressure developed by the Standard is computed from the mass load and effective area of the piston. Test Instrument error is determined by comparing the Test Instrument indication to the pressure developed by the Standard.

PB 154 688 $6.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
ANALYSIS OF THE FREE OSCILLATION IN SURGE AND SWAY OF A SHIP AS SPREAD MOORED, by Donald L. Bender. Interim rept. 22 Dec 58, 64p. 7 refs. Technical note TN-346.

DESCRIPTORS: *Ships, *Oscillation, *Mooring, Mathematical analysis, Water waves, Hydrodynamics.

Measurements are being made of the forces induced by waves in the moorings of an LST (about 5300 long tons displacement) as spread moored to act as a drilling rig tender by six 2-1/16 in. and one 1-1/4 in. stud link chains in about 45 ft of water in the open Gulf of Mexico off New Orleans, Louisiana. This report presents results of an analysis of the likely behavior of the ship in still water as background for a projected dynamic type analysis of the force data collected. By use of field measurements of mooring chain geometry, as adjusted in the office by use of the catenary equations in a specially developed graphical form, a satisfactory position of static equilibrium was calculated. The tension at the ship end of the various chains is found to vary from about 7 to 35 kips for the equilibrium position. The period of free oscillation of the moored ship, considered as an oscillating undamped spring-mass system, was calculated as about 28 seconds in surge and 37 seconds in sway and a graphical presentation made of the relationship between mooring force and ship movement in these modes. (Author)

PB 155 096 $2.60

Naval Ordnance Test Station, China Lake, Calif.
WATER-ENTRY WHIP DECELERATION OF FOUR FULL-SCALE TORPEDO MODELS WITH MODIFIED CONE HEADS, by James G. Waugh. 9 Oct 50, 27p. 11 refs. NAVORD rept. 1262; NOTS 328; ATI-93 280.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Aircraft torpedoes, *Torpedo models, Water entry, Cavitation, Deceleration, Configuration, Hydrodynamics.

Water-entry behavior studies were made on four full-scale dummy Mk-25 aircraft torpedoes with modified cone heads. Head configurations consisted of a plate cone, a spherical segment cone, a plate on notched cone, and a sphere cone. Launchings into fresh water were made at approximately 400- and 500-fps water-entry velocities, and 20-deg water-entry trajectory angle. Whip and water-entry deceleration were correlated with pitch and water-entry velocity. All configurations have positive whip for pitch angles flatter than - 4 deg, which indicates that the whip is predominantly influenced by the conical section of the head. The whip increases linearly as the pitch is increased. The first three configurations have similar whip and pitch sensitivities, while the fourth has greater whip and pitch sensitivity. The mean water-entry deceleration is proportional to the square of the velocity. The first three configurations have very similar water-entry decelerations, while the fourth has about half the mean water-entry deceleration of the first three. The drag coefficients of the plate- and sphere-cone configurations are in agreement with those obtained with full-diameter plate and hemisphere heads, which indicates that drag forces acting on the conical section of the heads must be small. (Author)

PB 149 079 $8.10

Technische Hogeschool, Delft (Netherlands).
A LINEARIZED THEORY FOR THE UNSTEADY MOTION OF A SUPERCAVITATING HYDROFOIL, by J. A. Geurst. Rept. no. 22 on Contract N62558-2269. Apr 60, 86p. 8 refs. AD-239 630.

DESCRIPTORS: *Hydrofoils, *Cavitation, Motion, Theory, Green's function, Lift, Moments.

A general linearized theory is given for the unsteady motion of fully cavitating two dimensional hydrofoils, in which the cavity length may be finite. This theory may be considered as a first order approximation to an unsteadily perturbed recentrant-jet flow, and a numerical approach is shown to be possible. The special case of the unsteady motion of the flat plate is developed which may also be applied to lifting profiles whose camber line is given by a polynomial in x.

METALLURGY

ANL-6177 $0.50

Argonne National Lab., Ill.
SOME ATTEMPTS TO CAST CENTRIFUGALLY FUEL ELEMENTS OF SMALL DIAMETER, by F. L. Yaggee. Rept. on Contract W-31-109-eng-38. Mar 61, 22p.

TID-7570(Del) $5.00

Atomic Energy Commission. Div. of Reactor Development, Washington, D. C.
ATOMIC ENERGY COMMISSION WELDING CONFERENCE: MINUTES OF THE EIGHTH ANNUAL [CONFERENCE] HELD IN RICHLAND, WASHINGTON OCTOBER 13-15, 1958. Declassified 19 July 60, 407p.

BMI-1512 $2.25

Battelle Memorial Inst., Columbus, Ohio.
THE MECHANISM OF PRESSURE BONDING, by G. W. Cunningham and J. W. Spretnak. Rept. on Contract W-7405-eng-92. 6 Apr 61, 115p.

PB 171 279 $1.75

British Welding Research Association.
INFLUENCE OF ALLOYING ELEMENTS ON CONTINUOUS COOLING TRANSFORMATION OF BINARY AND TERNARY ALLOYS OF IRON. Final technical rept. 1 Jan-31 Dec 60, on Contract DA 91-591-EUC-1369. Jan 61, 52p. 2 refs. Rept. no. C59/4/61-B2/19/61.

DESCRIPTORS: *Iron alloys, Temperature, *Cooling, *Transformations, *Phase studies, *Steel, Carbon, Manganese, Nickel, *Welding, Chromium, Molybdenum, Vanadium, *Heat resistant alloys, *Alloys.

The effects of individual alloying elements (carbon silicon, manganese, nickel, chromium, molybdenum, and vanadium) upon the transformation of iron under simulated weld heat affected zone conditions were investigated.

PB 156 021 $11.00

Gulton Industries, Inc., Metuchen, N. J.
ARC WELDING STUDY, by Jack B. Cooper. Summary rept. Phase A on Proj. U2510, Contract DA 30-069-ORD-2273. Aug 58, 145p. 6 refs.

This report released for sale to the public 1 June 61.

DESCRIPTORS: Aluminum alloys, *Arc welding, Cleaning, Ultrasonic radiation, Effectiveness, Welding.

The aim of this study is to determine the feasibility and effectiveness of applying the ultrasonic energy method to cleaning type 5086 aluminum alloy during arc welding and to determine the resulting quality of such welds. The object of this phase is to study the application of ultrasonics in conjunction with semi-automatic shielded inert gas metallic-arc welding equipment as follows: (1) The only pretreatment of the alloy premissible is degreasing. (2) Introduction of the ultrasound directly into the molten puddle and through the clamping mechanism and work to the puddle shall both be investigated. (Author)

OTS SB-460 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
METALWORKING. PART I: MACHINING. Apr 61, 24p. 357 refs. OTS Selective Bibliography SB-460.

DESCRIPTORS: *Machining, Bibliography, Automation, *Metal forming presses

Lists PB reports, AEC reports and translations added to the OTS collection during the period 1950 to April 1961. Contains information on Unconventional Machining Methods; such as, spark discharge, arc-discharge, electro-erosive, electrolytic, electron-beam activated, ultrasonic, chemical, and explosive and plasma jet cutting. Also covers reports on high temperature alloy machining; machining of titanium, tungsten, beryllium, zirconium, and other metals. Separately listed are reports on Machine Shop Practice and Automation and Controls. Some related reports cover brazing, welding and joining of metals. First part of a four-part series. (Author)

OTS SB-461 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
METALWORKING. PART II: MACHINE AND CUTTING TOOLS. Apr 61, 23p. 336 refs. OTS Selective Bibliography SB-461.

DESCRIPTORS: *Cutting tools, *Machine tools, Bibliography, *Metal forming presses, Design.

Lists PB reports, AEC reports and translations added to the OTS collection during the period 1950 to April 1961. Reports cover machine and cutting tool developments, designs, wear and life tests; cutting tool materials, fluids and lubricants; ceramic cutting tools; cutting tools for other than metals (such as ultrasonic cutting tools for quartz cutting, etc). Second part of a four-part series. (Author)

OTS SB-462 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
METALWORKING. PART III: CASTING AND FORGING. Apr 61, 26p. 431 refs. OTS Selective Bibliography SB-462.

DESCRIPTORS: *Casting, *Forging, *Metal forming presses, Bibliography.

Lists PB reports, AEC reports and translations on casting and forging added to the OTS collection during the period 1950 to April 1961. Reports cover information on electron-bombardment, induction, and vacuum melting; drip casting, slip, arc, centrifugal, precision investment, and continuous casting; molds, binders, and furnaces for casting. Also included are reports on explosive forging, vibro-forging, forgeability tests, and foundries. Third part of a four-part series. (Author)

OTS SB-463 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
METALWORKING. PART IV: ROLLING, DRAWING AND EXTRUSION. Apr 61, 16p. 254 refs. OTS Selective Bibliography SB-463.

DESCRIPTORS: *Extrusion, Metals, *Metal forming presses, Bibliography

Lists PB reports, AEC reports and translations added to the OTS collection during the period 1950 to April 1961. Reports include research on titanium rolling, hot and cold rolling of various metals, automation of rolling mills; wire drawing, drawing dies, drawing titanium and beryllium; extrusion of aluminum, beryllium, titanium, zirconium, and uranium among other metals. Fourth part of a four-part series. (Author)

SCDR-243-60 $0.50

Sandia Corp., Albuquerque, N. Mex.
DESIGN CONSIDERATIONS IN THE USE OF 5000 · SERIES ALUMINUM ALLOYS, by C. H. Maak. Mar 61, 19p.

PB 171 472 $0.50

Watertown Arsenal Labs., Mass.
THE GRAIN SIZE DISTRIBUTION IN METALS AND ITS INFLUENCE ON ULTRASONIC ATTENUATION MEASUREMENTS, by Emmanuel P. Papadakis. Feb 61, 18p. 11 refs. Technical rept. no. WAL TR 830.4/1; AD-252 941.

DESCRIPTORS: *Grains (Metallurgy), Microphotography, *Ultrasonic radiation, *Attenuation, Statistical functions, Determination, Transformations (Mathematics).

A transformation (derived by relating the number of spheres of a certain radius per unit volume to the number of circles smaller than a certain radius per unit area appearing on a plane cutting through the volume) was applied to several hypothetical grain size distributions for polycrystalline metals to find the resulting hypothetical area distribution of grain images on photomicrographs. Comparison of the hypothetical to the experimentally found area distributions gave certain conditions that the true volume distribution of grains must meet. A correction was computed for the attenuation formulas for Rayleigh scattering of ultrasonic waves in polycrystalline metals by taking averages over certain functions which were judged plausible for the volume distribution of grains. (Author)

PB 171 560 $0.75

Watertown Arsenal Labs., Mass.
A METHOD FOR DETERMINING THE PLASTIC FLOW PROPERTIES OF SHEET AND ROUND TENSILE SPECIMENS, by John Nunes and Frank R. Larson. Mar 61, 26p. 10 refs. Technical rept. no. WAL TR 111.1/1; AD-254 285.

DESCRIPTORS: *Sheets, Materials, *Plastic flow, Test methods, Mechanical properties.

An experimental procedure is described for obtaining continuous load-profile measurements of sheet and round tensile specimens during plastic flow. Some data obtained on tempered alloy steel, titanium, 301 stainless steel and an aluminum alloy are presented. With this procedure it was possible to obtain the following data from a single test curve: true stress-strain, true strain rate, mechanical anisotropy and "corrected" flow stress. Tests were conducted primarily at room temperature on sheet material with some low temperature tests conducted on the 301 stainless steel. (Author)

PB 171 561 $1.25

Watertown Arsenal Labs., Mass.
STRAIN HARDENING PROPERTIES OF HIGH-STRENGTH SHEET MATERIALS, by Frank R. Larson and John Nunes. Mar 61, 45p. 19 refs. Technical rept. no. WAL TR 834.2/2; AD-254 220.

DESCRIPTORS: *Sheets, *Materials, *Plastic flow, Temperature, *Properties, Stresses, *Steel, *Fatigue (Mechanics), Tool steel, Chromium, Molybdenum, Metals.

Through the use of a modified diameter gage which measured the principal width and thickness strains independently, it was possible to obtain more basic property data in tension testing of sheet materials. Materials studied were H-11 die steel, Cr Mo tool steel, AMS 5548, AMS 5547, 3/4 hard 301 stainless steel and some alloyed and unalloyed titanium. Effects of heat treatment and low testing temperature on flow stress, fracture stress, fracture strain and strain hardening were evaluated. A limited study on mechanical anisotropy and true strain rate was also conducted. (Author)

Ferrous Metals

PB 171 294 $2.00

National Research Corp., Cambridge, Mass.
EFFECTS OF SPACE ENVIRONMENT ON MATERIALS, by J. H. Atkins, R. L. Bisplinghoff and others. Rept. for May-Aug 60 on Materials Applications, Contract AF 33(616)6288. Dec 60, 72p. 51 refs. WADD Technical rept. 60-721.

DESCRIPTORS: *Space environmental conditions, Simulation, *Materials, Alloys, *Metals, Mechanical properties, Radiation effects, Electrical properties, Friction, Meteorites, Vacuum apparatus.

The purpose of this report is to provide materials research engineers, designers, and fabricators with information regarding the effects that space enviroment will have on the performance of materials, thus assisting them in the selection of materials for space applications. Since radiation, high vacuum, and their combined effects are considered to be among the major factors that influence the behavior of materials under space conditions, considerable attention is given in this report to the current knowledge in this area and to the problem of simulating these conditions in the laboratory. (Author)

PB 171 473 $0.75

Watertown Arsenal Labs., Mass.
EFFECT OF CERIUM ON 500°F EMBRITTLEMENT IN 9840 STEEL, by Joseph M. Dhosi. Feb 61, 19p. 6 refs. Technical rept. no. WAL TR 310/219; AD-253 210.

DESCRIPTORS: *Steel, Heat treatment, Hardening, Properties, *Cerium, Metallurgy.

Split heats of 9840 steel, containing various amounts of cerium, from 0 to 0.28%, were melted. The steels, in both cast and wrought conditions, were quenched and tempered and tested in impact. It was found that cerium, in the presence of low residual amounts of nitrogen and sulfur, has a detrimental effect on the impact energy of this steel. (Author)

Nonferrous (except light) Metals

ANL-6317 $1.00

Argonne National Lab., Ill.
A CONTRIBUTION TO THE STUDY OF THE REDUCTION OF UF_4 TO URANIUM METAL, by J. Milosavljevich and J. Baird. Rept. on Contract W-31-109-eng-38. Feb 61, 38p.

PB 171 781 $1.25

Materials Central, Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
ELEVATED TEMPERATURE CREEP PROPERTIES OF B12OVCA SHEET MATERIAL, by Edward L. Horne and William D. Harden, III. Rept. on Materials Application. Nov 60, 47p. 2 refs. WADD Technical rept. 60-525.

DESCRIPTORS: *Titanium alloys, Alloys, *Creep, Tensile properties, Rupture, Temperature, *Sheets, Deformation, Mechanical properties.

This investigation was made to determine creep properties at elevated temperatures of aged B12OVCA titanium alloy to aid in the evaluation of this alloy. Tests were conducted at 600°F, 650°F and 700°F on sheet specimens cut both perpendicular and parallel to the direction of rolling. Differences in properties with respect to direction of rolling were small. Data includes ultimate tensile strength, tensile yield strength, and creep rupture properties at each temperature. Ultimate tensile strengths varied from 187,700 psi at 75°F to 166,000 psi at 700°F. Creep deformation becomes more rapid at higher temperatures, indicating that 700°F is close to the long-time temperature limit of this alloy. There is marked scatter of the creep properties of the alloy at 600°F but the average strength properties are good. (Author)

OTS SB-458 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
COPPER. Apr 61, 25p. 465 refs. OTS Selective Bibliography SB-458.

DESCRIPTORS: *Copper, Bibliography, Copper alloys, Copper compounds, Copper wire, Bronze, Brass, High temperature research, Low temperature research.

Lists PB reports, AEC reports, and translations on copper metals, alloys, wire, and brass and bronze. Covers research on copper-gold alloys, other copper alloys containing such metals as titanium, nickel, cerium, beryllium, indium, tin, and aluminum; general research on low and high temperature properties; copper films, powder metallurgy, and electrolytic copper; semiconducting properties of intermetallic compounds of copper; high temperature insulation of copper wire. (Author)

Structural Metallurgy and Corrosion

BMI-1507 $0.75

Battelle Memorial Inst., Columbus, Ohio.
CORROSION OF THORIUM AND URANIUM UNDER STORAGE CONDITIONS, by Elmer F. Stephan, Paul D. Miller, and Frederick W. Fink. Rept. on Contract W-7405-eng-92. 21 Mar 61, 25p.

PB 155 739 $9.10

Battelle Memorial Inst., Columbus, Ohio.
METALLURGICAL RESEARCH AND DEVELOPMENT IN ELECTRON DEVICES, by D. J. Maykuth, G. S. Root and others. Final rept. 15 Dec 58-14 Jan 60, on Contract DA 36-039-sc-78253. [1960] 109p. 27 refs; AD-237 297.

This report released for sale to the public 1 June 61

DESCRIPTORS: *Electron tubes, Materials, Niobium, Hafnium, *Hafnium compounds, *Niobium alloys, Wire, *Molybdenum, Nickel, Mechanical properties, Welding.

Columbium, hafnium, and binary alloys based on both metals were fabricated to fine wires and evaluated to determine their applicability for use in electron tubes. Alloying both metals resulted in considerably improving their strengths, at temperatures through 1000 C. Of the alloys investigated, a columbium-0.65 per cent zirconium alloy and hafnium alloys containing 2.5 and 5 per cent columbium showed optimum combinations of workability, strength and ductility in these respective alloy bases. These alloys show considerable promise for use as grid and/or structural components operating at elevated temperatures. A laboratory study was conducted to investigate the characteristics of resistance cross-wire welds between

various combinations of molybdenum and nickel. The joint strength of molybdenum-molybdenum welds was shown to be a function of the recrystallized zone of molybdenum. The strongest welds were produced in joints having the smallest grain sizes and largest bond areas. Joint efficiencies in molybdenum-molybdenum cross-wire welds of about twice the reported literature values were obtained. However, even the best molybdenum welds had much lower joint efficiencies than nickel-nickel combinations. Joint strengths of molybdenum cross-wire welds were increased 50 to 100 per cent by using nickel-foil inserts. Preliminary attempts to ultrasonically weld molybdenum and nickel are described. (Author)

BNL-585 (T-146) $1.00

Brookhaven National Lab., Upton, N. Y.
CORROSION STUDIES FOR A FUSED SALT-LIQUID METAL EXTRACTION PROCESS FOR THE LIQUID METAL FUEL REACTOR, by H. Susskind, F. B. Hill and others. 30 June 60, 41p.

PB 171 268 $2.50

Carnegie Inst. of Tech., Pittsburgh, Pa.
FRACTURE ARREST BY RIVETED STIFFENERS, by James P. Romualdi and Paul H. Sanders. Final rept. on Contract AF 49(638)237. Oct 60, 120p. 11 refs. AFOSR TR-60-174; AD-251 014.

DESCRIPTORS: *Fracture (Mechanics), *Rivets, Mathematical analysis, Structures, *Stresses, Brittle materials, *Failure (Mechanics).

Open-ended Terms: Stiffeners.

The occurrence of rapid, apparently brittle fracture has become more prevalent with the advent of higher working stresses and lower operating temperatures. The problem is particularly severe in the aircraft, shipbuilding and pressure vessel industries. The mechanics of arresting a running crack before complete failure of the structure is one aspect of the problem. This facet of the study of fracture is of considerable interest and has many immediate applications. When structures are designed using crack-arresting criteria they are referred to as "fail-safe." This thesis considers the effectiveness of riveted stiffeners as crack arrestors. The theoretical analysis, based on an energy release concept, is checked by experiments for several cases. Results of the investigation are interpreted in terms of design recommendations.

HW-67370 $2.00

Hanford Atomic Products Operation, Richland, Wash.
MECHANISMS AND KINETICS OF URANIUM CORROSION AND URANIUM CORE FUEL ELEMENT RUPTURES IN WATER AND STEAM, by V. H. Troutner. Rept. on Contract AT(45-1)-1350. 21 July 60, 90p.

PB 155 910 $3.60

Westinghouse Electric Corp., Bloomfield, N. J.
RESEARCH AND DEVELOPMENT WORK ON THE EXTRUDABILITY AND EXTRUDED PROPERTIES OF SINTERED AND ARC-CAST MOLYBDENUM ALLOYS, by W. A. Taebel. Rept. no. 11 (Final) for 3 Apr 58-31 Mar 60 on Contract DA 30-069-505-ORD-2246. 31 Mar 60, 35p. WAL 435.6/1; AD-241 484.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Molybdenum alloys, *Extrusion, Sintered alloys, Molybdenum castings, Powder alloys, Mechanical properties, Powder metallurgy.

The work entailed: (1) Preparation of sintered billets of the alloy Mo-0.1% Co by powder metallurgical techniques, the procurement from external sources of arc-cast billets of the alloy Mo-0.5% Ti; (2) Extrusion of the billets of each type at various temperatures and reduction ratios; and (3) Determination of the physical and mechanical properties, and microstructure of the extruded products in order to establish their relationship to operating procedures.

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

PB 154 315 $2.60

Aerojet-General Corp., Azusa, Calif.
IRRADIATION YIELDS OF RADICALS IN GAMMA-IRRADIATED ICE AT 4.2 AND 77 K, by Seymour Siegel, John M. Flournoy, and Lillian H. Baum. Rept. on Contract AF 18(603)110. Jan 61, 28p. 8 refs. Aerojet rept. TN-39; AFOSR TN-60-947; AD-250 131

DESCRIPTORS: *Ice, *Deuterated compounds, Paramagnetic resonance, Gamma rays, *Gamma ray spectroscopy, Low temperature research.

The electron-paramagnetic-resonance (EPR) spectra of both ice and deuterated ice which were subjected to gamma-irradiation at 4.2 K are presented and discussed. Experimental radical irradiation yields at 4.2 K are reported for the H20 system as a function of sustained irradiation dosage. A comparison between the irradiation yields at 4.2 and 77 K is given, and the resulting similarities are discussed in terms of intra-spur reactions. Finally, preliminary evidence is presented for the existence of an appreciable isotope effect for the irradiation yields in a mixture of H20 and D20. (Author)

BMI-1496 $2.50

Battelle Memorial Inst., Columbus, Ohio.
PROGRESS RELATING TO CIVILIAN APPLICATIONS DURING JANUARY, 1961, Rept. on Contract W-7405-eng-92. 1 Feb 61, 116p.

PB 155 912 $11.50

Convair, Fort Worth, Tex.
GUIDE FOR HEALTH PHYSICS PROCEDURES ON A PROPOSED NUCLEAR AIR BASE. Rept. on A Study to Design Nuclear Instrumentation System for Ground Operations, Contract AF 33(616)5365. Nov 59, 156p. 62 refs. WADC Technical rept. 59-692; AD-233 450.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Landing fields, Airports, Nuclear propulsion, *Radiation hazards, Radioactivity, Instrumentation, Hazards, Aircraft nuclear propulsion, Radiobiology, *Job analysis.

Based on an analysis of proposed nuclear aircraft operational base activities, a complete health physics organization is described. A series of job titles and descriptions is listed giving the job specialty, duties, responsibilities, and qualifications for each person required in the organization, as well as the duties, functions, and procedures for each branch. Sample schedules for instrument calibration are included. Specific procedures are detailed for area and personnel monitoring functions, including health physics procedures for each area and building, and film dosimetry, bioassay and in vivo counting procedures. A complete program of environmental radioactivity surveillance for an area of approximately 30,000 square miles is described. Emergency procedures and practices are described, and a schedule of emergency action for a hypothetical major disaster is included. (Author)

HW-67219 $2.50

Hanford Atomic Products Operation, Richland, Wash.
NUCLEAR PHYSICS RESEARCH QUARTERLY REPORT, JULY, AUGUST, SEPTEMBER, 1960. Rept. on Contract AT(45-1)-1350. 20 Oct 60, 114p.

UCRL-9527 $0.50

Lawrence Radiation Lab., U. of California, Berkeley
EMULSION AND BUBBLE-CHAMBER STATISTICS FOR THE DETERMINATION OF TRACK DENSITY, by Akbar Ahmadzadeh. Rept. on Contract W-7405-eng-48. 12 Jan 61, 17p.

NAS-NS-3023 $0.75

Lawrence Radiation Lab., U. of California, Livermore.
THE RADIOCHEMISTRY OF TIN, by W. E. Nervik. 10 Oct 60, 68p.

PB 161 593 $1.50

National Bureau of Standards, Washington, D. C.
RESEARCH PROGRAM OF THE RADIATION PHYSICS DIVISION NATIONAL BUREAU OF STANDARDS, by W. R. Ney and L. S. Taylor. May 61, 52p. Technical note no. 92.

DESCRIPTORS: *Nuclear physics, Radiological physics, *Research program administration, *Nuclear physics laboratories.

This report describes the research program of the Radiation Physics Division. It includes a statement of the mission of the division, a list of senior staff members, descriptions of the facilities available to the division staff, and detailed descriptions of the research programs of the various sections of the division.

PB 155 716 $3.60

Naval Radiological Defense Lab., San Francisco, Calif.
QUANTITATIVE RADIOCHEMICAL CARRIER-FREE PROCEDURES, by L. Wish and E. C. Freiling. 8 July 60, 34p. 14 refs. USNRDL-464; AD-243 587.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Fission products, *Ions, Radioactive isotopes, *Exchange reactions, Scintillation counters, Adsorption.

A compilation of the quantitative sequential ion-exchange procedures for the determination of some radionuclides in fission product mixtures is given. These methods were developed with the aim of making radiochemical analysis more rapid, more efficient, and adaptable to handling of large numbers of samples with minimum operator time. (Author)

NAS-NS-3026 $0.50

Nuclear Science and Engineering Corp., Pittsburgh, Pa.
THE RADIOCHEMISTRY OF MERCURY. Dec 60, 54p.

NAS-NS-3027 $0.75

Oak Ridge National Lab., Tenn.
THE RADIOCHEMISTRY OF COPPER, by F. F. Dyer and G. W. Leddicotte. Apr 61, 59p.

NAS-NS-3028 $0.50

Oak Ridge National Lab., Tenn.
THE RADIOCHEMISTRY OF RHENIUM, by G. W. Leddicotte. Apr 61, 48p.

TID-3072 (Rev. 1) $2.75

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
CONTROLLED THERMONUCLEAR REACTIONS. A SELECTIVE BIBLIOGRAPHY, comp. by Sidney F. Lanier, Raymond L. Scott, and Thomas W. Scott. Jan 61, 182p.

SCR-296 $0.50

Sandia Corp., Albuquerque, N. Mex.
A TECHNIQUE FOR OBTAINING PARTICLE ACTIVITY AND SIZE DISTRIBUTIONS, by M. Cowan, Jr. Apr 61, 12p.

DP-564 $0.50

Savannah River Lab., Aiken, S. C.
RADIOACTIVE WASTE MANAGEMENT AT THE SAVANNAH RIVER PLANT, by J. H Horton. Rept. on Contract AT(07-2)-1. Mar 61, 13p.

NAS-NS-3024 $0.50

Washington U., Seattle.
THE RADIOCHEMISTRY OF MAGNESIUM, by A. W. Fairhall. Jan 61, 28p.

Instruments and Installations

PB 155 717 $3.60

Air Force Special Weapons Center, Kirtland AFB., N. Mex.
EVALUATION OF THE MINIRAD RADIACMETER, by Thomas P. Cain and Florian T. Kokoszka. Apr 60, 34p. AFSWC-TN-60-7.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Dosimeters, Tests, Gamma counters, Survival kits, Instrumentation.

Field evaluation of the instrument indicated that the Minirad was generally satisfactory for use as a survival kit instrument. Minor deficiencies were of a nature that could be corrected by design changes and closer inspection in quality control. The minirad is considered suitable for Air Force use as an interim item of equipment. (Author)

BNL-654(T-211) $0.50

Brookhaven National Lab., Upton, N. Y.
MEASUREMENT OF RANGE AND INTENSITY OF CYCLOTRON BEAMS, by J. R. Grover, B. M. Foreman Jr. and others. Sep 60, 7p.

HW-67045 $1.25

Hanford Atomic Products Operations, Richland, Wash
HANFORD WHOLE BODY COUNTER 1959 ACTIVITIES, by W. C. Roesch, R. C. McCall, and H. E. Palmer. Rept. on Contract AT(45-1)-1350. Dec 60, 51p.

TID-6567 $0.75

Office of Technical Information, Atomic Energy Commission, Washington, D C.
STRONTIUM-90 ON THE EARTH'S SURFACE. SUMMARY AND INTERPRETATION OF A WORLD-WIDE SOIL SAMPLING PROGRAM, by Lyle T. Alexander (Soil Conservation Service), Edward P. Hardy, Jr. (Health and Safety Lab.), Lester Machta (Weather Bureau) and others. Feb 61, 25p.

DP-472 $0.75

Savannah River Lab., Aiken, S. C.
AN EMERGENCY NEUTRON DOSIMETER, by J. E. Hoy. Rept. on Contract AT(07-2)-1. Sep 60, 29p.

Nuclear Engineering and Power

IDO-28567 $3.00

Aerojet-General Nucleonics, San Ramon, Calif.
ARMY GAS-COOLED REACTOR SYSTEMS PROGRAM. Semiannual progress rept. 1 July-31 Dec 60, on Contract AF(10-1)-880. 22 Feb 61. 210p.

APAE-39 $5.50

Alco Products, Inc., Schenectady, N. Y.
DESIGN ANALYSIS OF A PREPACKAGED NUCLEAR POWER PLANT FOR AN ICE CAP LOCATION. Rept. on Contract DA-44-009-eng-3638. 15 Jan 59, 483p.

AEPSC-632 $2.50

American Electric Power Service Corp., New York.
PROTOTYPE AND FULL-SCALE POWER PLANTS GAS-COOLED REACTOR PROJECT. Progress rept. no. 4, 1 Mar-1 Sep 60, on Contract AT-(38-1)-200. 1 Sep 60, 110p.

ANL-6285

Argonne National Lab., Ill.
ARGONAUT REACTOR DATABOOK. A COMPILATION OF EXPERIMENTAL AND THEORETICAL RESULTS OF WORK DONE WITH, OR RELATED TO, THE ARGONAUT REACTOR TO JULY 1960, by W. J. Sturm and D. A. Daavettila. Rept. on Contract W-31-109-eng-38. Jan 61, 177p.

ANL-6343 $2.00

Argonne National Lab., Ill.
REACTOR DEVELOPMENT PROGRAM. Progress rept. Mar 61, on Contract W-31-109-eng-38. Apr 61, 91p.

TID-6882 $0.75

Atomic Energy Commission. Div. of Reactor Development, Washington, D. C.
EVALUATION OF THE ORGANIC FOULING PROBLEM IN THE OMRE. 3 June 60, 35p.

TID-11295 (Suppl.) $1.25

Atomic Energy Commission, Div. of Reactor Development, Washington, D. C.
NUCLEAR FUELS AND MATERIALS DEVELOPMENT. Suppl. Feb 61, 52p.

TID-7598 $2.50

Atomic Energy Commission. Div. of Reactor Development, Washington, D. C.
PROCEEDINGS OF THE POWER REACTOR IN-CORE INSTRUMENTATION MEETING, WASHINGTON, D. C. APRIL 28-29, 1960. Mar 61, 117p.

NAA-SR-5369 $0.75

Atomics International, Canoga Park, Calif.
DEVELOPMENT OF A VARIABLE ORIFICE FOR HNPF FUEL CHANNELS, by C. J. Baroczy, J. A. Hagel, and W. D. Leonard. Rept. on Contract AT(11-1)-GEN-8. 1 May 61, 35p.

BMI-1501 $2.00

Battelle Memorial Inst., Columbus, Ohio.
ML-1-1B CRITICAL-ASSEMBLY STUDIES, by Joseph W. Ray, Richard G. Matthews and others. Rept. on Contract W-7405-eng-92. 21 Feb 61, 77p.

BNL-618 (S-55) $2.00

Brookhaven National Lab., Upton, N. Y.
NUCLEAR ENGINEERING DEPARTMENT. Progress rept. 1 Jan-30 Apr 60. Feb 61, 94p.

DP-585 $1.25

du Pont de Nemours, E. I., and Co., Wilmington, Del.
HEAVY WATER MODERATED POWER REACTORS, by D. F. Babcock and R. R. Hood. Progress rept. Jan 61, on Contract AT(07-2)-1. Mar 61, 47p.

DP-595 $0.75

du Pont de Nemours, E. I., and Co., Wilmington, Del.
HEAVY WATER MODERATED POWER REACTORS. Progress rept. Feb 61 on Contract AT(07-2)-1. Apr 61, 30p.

DP-520 $3.00

du Pont de Nemours, E. I., and Co., Wilmington, Del.
HEAVY-WATER-MODERATED POWER REACTORS: ENGINEERING AND ECONOMIC EVALUATIONS. VOLUME II. ENGINEERING STUDIES AND TECHNICAL DATA. Rept. on Contract AT(07-2)-1, 198p.

ORO-325 $2.00

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
MATERIALS FOR HIGH TEMPERATURE NUCLEAR ENGINEERING APPLICATIONS, by J. D. Fleming and J. W. Johnson. Progress rept. no. 2, part 1, 15 Aug 59 15 Aug 60, on Contract AT-(40-1)-2483. Dec 60, 84p.

LAMS-2489 $0.50

Los Alamos Scientific Lab., N. Mex.
CRITICAL MASSES OF COMPOSITES OF O_y AND Pu-239-240 IN FLATTOP GEOMETRY, by D. M. Barton, William Bernard, and G. E. Hansen. Rept. on Contract W-7405-eng-36. Dec 60, 18p.

LAMS-2531 $0.50

Los Alamos Scientific Lab., N. Mex.
LAMPRE PROGRAM Quarterly status rept. for period ending 20 Feb 61, on Contract W-7405-eng-36. 31 Mar 61, 26p.

LAMS-2529 $1.25

Los Alamos Scientific Lab., N. Mex.
THE LASL CONTROLLED THERMONUCLEAR RESEARCH PROGRAM. Quarterly status rept. for period ending 20 Feb 61 on Contract W-7405-eng-36. Mar 61, 49p.

MND-P-3010 $4.00

Martin Co., Baltimore, Md.
SNAP PROGRAMS. Quarterly progress rept. no. 2, tasks 2, 3, 5 and 6, 1 Jan-31 Mar 60, on Contract AT(30-3)217. Dec 60, 333p.

ORNL-3061 $2.50

Oak Ridge National Lab., Tenn.
HOMOGENEOUS REACTOR PROGRAM. Progress rept 1 Aug-30 Nov 60, on Contract W-7405-eng-26. 30 Nov 60, 113p.

IDO-16570 $2.50

Phillips Petroleum Co., Idaho Falls.
EXPERIMENTAL ORGANIC COOLED REACTOR. CONCEPTUAL DESIGN, by W. E. Nyer and J. H. Rainwater. 1 Dec 59, 242p.

IDO-16638 $0.50

Phillips Petroleum Co., Idaho Falls.
PERTURBATION MEASUREMENT OF $1/\beta_{eff}$ USING A 1/v ABSORBER, by A. H. Spano. Rept. on Contract AF(10-1)-205. 3 Mar 61, 19p.

TID-8530 $3.50

Sargent and Lundy, Chicago, Ill.
EVALUATION AND DESIGN HEAVY WATER MODERATED POWER REACTOR PLANTS. Rept. on Contract AT (38-1) 213. 28 Apr 60, 259p.

TID-852[illegible] $2.75

Sargent and Lundy, Chicago, Ill.
EVALUATION AND DESIGN HEAVY WATER MODERATED POWER REACTOR PLANTS. Rept. on Contract AT(38-1) 213. 30 June 60, 177p.

NDA-2131-6 $2.50

Sargent and Lundy, Chicago, Ill. and Nuclear Development Corp. of America, White Plains, N. Y.
DESIGN EVALUATION AND COMPARISON 200 MWe BOILING D_2O PRESSURE TUBE INDIRECT AND DIRECT CYCLE POWER REACTOR PLANTS. Rept. on Contracts AT (38-1) 213 and AT (30-1)-2303. (IX). 30 June 60, 119p.

Radioactivity

PB 155 771 $4.60

Naval Radiological Defense Lab., San Francisco, Calif.
OPERATION STONEMAN II, by W. J. Friedman. Radiological safety rept. 8 June 60, 45p. 5 refs. Research and development technical rept. USNRDL-TR-429; AD-242 409.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Radiation hazards, Countermeasures, *Safety, *Radiological contamination, Dose rate, *Decontamination, Military personnel, *Radioactive fallout, Simulation, Protective clothing, Monitors, Dosimeters, Air, Sampling, *Radiological physics, Radioactive waste disposal, Military operations.

Open-ended Terms: Stoneman II.

The health physics aspects of a field-scale operation involving the dispersal and decontamination of ton quantities of synthetic radioactive fallout are described. Provision of radiological safety services for the operation involved pre-operational planning for logistics and services, training and indoctrination program for Radsafe personnel, design and operation of a change house and personnel decontamination center, a dosimetry program and interpretation of its data, consultation with the project officer on health physics problems, waste disposal, environmental monitoring during pre-operational, operational, and post-operational phases, and radiological monitoring for the operation. The problems involved in the receipt, hot cell processing, and dispersal of multi-curie quantities of the La^{140} tracer are described. Radiation and contamination controls were maintained, such that there were no inadvertent radiation over-exposures above the maximum permissible limits set for personnel for the operation. Types and quantities of equipment and instrumentation required for an operation of this type are given. A case of ionic skin contamination is described, including decontamination procedure and dosimetry calculations. Recommendations are made for the improvement of radiological safety operations in future operations. (Author)

IDO-16660 $0.50

Phillips Petroleum Co., Idaho Falls.
ADDITIONAL MEASUREMENTS OF THE REACTIVITY TRANSIENT IN IRRADIATED THORIUM, by R. G. Nisle and D. A. Millsap. Rept. on Contract AT (10-1)-205. 13 Mar 61, 18p.

Waste Disposal

IDO-14537 $0.50

Phillips Petroleum Co., Idaho Falls.
CALCINATION OF ZIRCONIUM FLUORIDE WASTE SOLUTIONS, by R. L. Hickok and J. S. Madachy. Interim rept. on Contract AT(10-1)-205. 8 Mar 61, 13p.

NYO-9577 $2.50

Radiation Applications, Inc., New York, N. Y.
THE REMOVAL OF STRONTIUM AND CESIUM FROM NUCLEAR WASTE SOLUTIONS BY FOAM SEPARATION, by E. Schonfeld, R. Sanford and others. Final rept. on Contract AT(30-1)-2093. 29 July 60, 141p.

PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT

PB 171 298 $1.25

Kentucky Research Foundation, Lexington.
QUESTIONNAIRE DESIGN AND MACHINE PROCESSING SYSTEMS FOR UNIFORM MATERIAL COMPARISON STUDIES, by John W. Hamblen. Rept. for 1 Feb-31 Dec 60 on Materials Application, Contract AF 33(616)7082. Jan 61, 49p. 7 refs. WADD Technical rept. 60-852.

DESCRIPTORS: *Data, *Collecting methods, Public opinion polls, Aviation personnel, *Clothing, *Data processing systems, *Materials, Analysis.

The REDI-CODED format for survey questionnaires is introduced. General comparisons are made among manual, sorter, accounting machine, statistical sorter, small computer, medium sized computer, and large scale computer systems with regard to costs and efficiency in processing survey data. Specific units are referred to as being typical in each category. Some "rules of thumb" are given for selecting a given system. Standard sampling techniques are discussed briefly and stratified systematic sampling with proportional allocation is recommended for USAF uniform material comparison studies. An IBM 407 panel is described which will accomplish systematic sampling from alphabetically arranged (not required) card decks. (Author)

PHYSICS

IS-191 $1.25

Ames Lab., Iowa State U. of Science and Tech.
ANNUAL SUMMARY RESEARCH REPORT IN PHYSICS, 1 JULY 59-30 JUNE 60. Rept. on Contract W-7405-eng-82. Sep 60, 71p.

PB 154 368 $2.60

Army Engineer Research and Development Labs., Fort Belvoir, Va.
BLACK-BODY RADIANCE DIFFERENTIALS AS INFLUENCED BY THE ATMOSPHERE, by Seymour Berler. 26 Aug 60, 22p. 11 refs. Technical rept. 1647-RR; AD-246 221.

DESCRIPTORS: *Atmosphere, *Blackbody radiation, Target position indicators, Absorption, Water vapor, Infrared images, *Infrared detectors, Measurement, Tables, Thermal radiation, Temperature.

The capabilities of ground-to-ground infrared detection and imaging equipment are evaluated by providing a means for determining the influence of the atmosphere on infrared detection and imaging equipment. The following information is presented in tabular or graphical form: (1) Data on the increment of the spectral black-body radiance per 1° K for temperatures from 220° K to 320° K and wavelengths from 2.8 to 14.0 microns, and (2) Data on the apparent radiance difference in different wavelength regions, for a 1° K blackbody temperature difference for three different atmospheric conditions and temperatures ranging from 220° K to 320° K. (Author)

PB 154 605-1 $8.10

Lockheed Aircraft Corp, Sunnyvale, Calif.
TRANSIENT RESPONSE OF SOME DISTRIBUTED PARAMETER CONFIGURATIONS. PART I, by Duane Starner. Technical note. Sep 60, 89p. 4 refs. LMSD-703095; AD-245 993.

DESCRIPTORS: *Electrical networks, Synthesis, Numerical methods and procedures, Differential equations, Integral transforms, Programming, Series, *Transients.

A study of the transient response of particular distributed parameter networks is described. An exact analysis is presented for checking approximation methods. This analysis is also useful when extreme accuracy is required. Theoretical and experimental responses are compared and a computer program is given for evaluation of the theoretical responses. This information is not intended to be sufficient for the design of a circuit. (Author)

PB 154 107 $3.60

Notre Dame U., Ind.
THE METAL INSULATOR CONTACT. PART I. THE KINETICS OF KCl ON W BY FIELD EMISSION MICROSCOPY, by M. Silver and R. S. Witte. Reprint Series. Technical rept. on Contract Nonr-1623(01). 5 Apr 60, 37p. 9 refs. AD-236 459.

DESCRIPTORS: *Metals, Insulating materials, Potassium compounds, Tungsten, Thermionic emission, Analysis, Electron microscopes, Field emission, Deposits, *Electron microscopy.

KCl dissociates in the presence of tungsten at room temperature forming a tungsten chloride layer by epitaxy on tungsten. Potassium and any undissociated KCl is completely desorbed below 600°K with an activation energy of 10 ± 2 kcal/mole. The tungsten chloride layer is unstable above about 1100°K.

PB 171 278 $2.75

Radiation, Inc. [Melbourne, Fla.]
PHYSICS OF THE VAN ALLEN RADIATION BELTS, by Donald C. Hock. Technical rept. on Contract AF 29(601)2348. Dec 60, 121p. 48 refs. AFSWC TR-60-57; AD-252 223.

DESCRIPTORS: *Van Allen radiation belt, *Electrons, Measurement, Beta decay, *Physics.

Open-ended Terms: Argus.

A study concerned with the physical aspects of the Radiation Belts is presented. It deals with geomagnetically trapped electrons from neutron albedo decay. The analysis assumes a decay density function which fits the results of Hess' calculations and computes the angular distribution and intensity of the source and the energy

spectrum of the injected electrons. The life expectancy of these electrons is then discussed relative to the manner in which the electrons lose energy: by pure energy loss, scattering without energy loss, or by scattering and energy loss. Section 2.0 discusses the degeneracies in the radiation belts and includes a section on the energy loss of protons due to scattering from atmospheric constituents. It considers long and short range coulomb collisions, and provides approximate energy losses from coulomb collisions in ionized and neutral hydrogen, ionized oxygen, and air. This section also discusses the breakdown of the adiabatic invariants, and a curve is presented showing the maximum allowed proton energy trappable as a function of distance from the center of the earth because of the change in the magnetic moment of the proton. Section 3.0 presents a study on variations and fluctuations in the belt with respect to time and space. The azimuthal drift of trapped particles and radial motion of trapped particles is discussed. (Author)

Acoustics

PB 171 778 $2.50

Armour Research Foundation, Chicago, Ill.
SOUND PROPAGATION NEAR THE EARTH'S SURFACE AS INFLUENCED BY WEATHER CONDITIONS, by M. D. Burkhard, H. B. Karplus, and H. J Sabine. Rept. on Generation, Propagation, Action, and Control of Acoustic Energy, Contracts AF 33(616)2470 and AF 33(616)5091. Dec 60, 120p. 4 refs. WADC Technical rept. 57-353, Part II; AD-254 670.

DESCRIPTORS: *Sound, Propagation, *Meteorology, Atmosphere, Attenuation, Airplane noise, *Acoustics.

The effects of weather on the propagation of sound from an elevated source to the ground have been studied. Variations in attenuation were reported in Part I (PB 137 359) for weather in all seasons in the Chicago area. Part I was limited to source elevations of 14-1/2°, 30°, and 90° above the horizon. In this study measurements have been extended to include weather conditions in Arizona and propagation angles down to 2° elevation above the horizon. Attenuations have been correlated with absolute humidity, temperature, temperature gradient, wind velocity, and wind direction. For source elevations of 5° and higher and source altitudes above a few hundred feet, only temperature and absolute humidity have a significant effect on attenuation. For source elevations of less than 5°, large attenuations occur in the presence of strong wind and temperature gradients. These are due to upwind refraction of sound and the resulting creation of shadow zones on the ground. (Author)

PB 171 779 $1.50

Armour Research Foundation, Chicago, Ill.
SOUND PROPAGATION NEAR THE EARTH'S SURFACE AS INFLUENCED BY WEATHER CONDITIONS, by H. J. Sabine, V. J. Raelson, and M. D. Burkhard. Rept. on Generation, Propagation, Action, and Control of Acoustic Energy, Contract AF 33(616)5091. Jan 61, 56p. 11 refs. WADC Technical rept. 57-353, Part III; AD-254 671.

DESCRIPTORS: *Sound, Propagation, *Meteorology, Atmosphere, Attenuation, Rockets, Launching, Noise, Acoustics.

The effects of weather on the propagation of sound from high-power elevated sources, such as large rockets, were studied at altitudes to 80,000 feet and over horizontal ranges to 15 miles. A theoretical analysis is reported of the principal atmospheric factors affecting long range propagation: (a) molecular absorption as a function of temperature and absolute humidity at various altitudes, (b) variation of the characteristic impedance of air with altitude, and (c) large scale refraction due to wind and temperature gradients. Of these, only molecular absorption at high altitudes significantly affects propagation. Limited measurements of atmospheric attenuation were made, using a propeller airplane sound source at altitudes to 14,000 ft and ranges to 4 miles. The results agree in general with those predicted by extrapolation of previous data for smaller altitudes and ranges, except that residual attenuation due to scattering is smaller. (Author) (See also PB 171 778)

PB 171 780 $0.75

Armour Research Foundation, Chicago, Ill.
SOUND PROPAGATION NEAR THE EARTH'S SURFACE AS INFLUENCED BY WEATHER CONDITIONS, by H. J. Sabine. Rept. on Generation, Propagation, Action, and Control of Acoustic Energy, Contract AF 33(616)5091. Jan 61, 30p. 3 refs. WADC Technical rept. 57-353, Part IV; AD-254 672.

DESCRIPTORS: *Sound, Propagation, *Meteorology, Atmosphere, Attenuation, Rockets, Launching, Noise, Acoustics.

This report outlines engineering procedures for estimating the atmospheric attenuation of sound propagated from an elevated source to ground as a function of distance, source elevation angle, and meteorological data of the type which would be obtained routinely at an air or missile base. These procedures are based on the results of an experimental program which covered distances up to 4 miles and source altitudes up to 14,000 feet. (Author) (See also PB 171 779)

PB 171 794 $1.25

Naval Ordnance Lab., White Oak, Md.
EVALUATION OF SUPERMENDUR CUT CORES FOR AN ELECTRO-MAGNETIC TRANSDUCER, by John F. Haben. 4 Nov 60, 43p. 1 ref. NAVWEPS rept. 7337; AD-252 579.

DESCRIPTORS: *Magnetic cores, *Transducers, *Materials, Iron alloys, Cobalt alloys, Magnetic properties, *Sonar projectors, Electromagnetism, Sonar, Encapsulation, Tests.

The feasibility of improving variable reluctance sonar transducer magnetic core materials by substituting a Supermendur (49% Co - 49% Fe - 2% V) tape wound core for the presently used grain-oriented silicon-iron cores was investigated. A 43-percent improvement in residual induction over the silicon-iron cores was realized by developing a technique to cut Supermendur core materials without degradation. This new core

material promises to improve the efficiency of the transducer by providing either a more compact design or an increase in its output. The method consists of electrolytic cutting of a rigid encapsulation of the Supermendur core followed by careful lapping of the degraded surface. Some engineering effort remains to extend this laboratory development to a commercial level. (Author)

PB 155 097 $1.10

Navy Underwater Sound Lab., Fort Trumbull, New London, Conn.
REVIEW OF TANK FACILITIES AVAILABLE FOR ACOUSTIC MEASUREMENTS, by John G. Mavroides. 31 Mar 48, 8p. 2 refs.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Underwater sound, Measurement, Instrumentation.

Electricity and Magnetism

PB 154 687 $6.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
INTRODUCTORY BACKGROUND THEORY FOR ELECTROMAGNETIC INTERFERENCE ANALYSIS, by L. Cromwell. Aug 58, 62p. 27 refs. Technical note N-344.

DESCRIPTORS: *Radio interference, Mathematical anlaysis, *Electromagnetic theory, Transmission lines, *Electrostatics, Dielectrics, Conductors, Partial differential equations, Vector analysis, *Electromagnetism.

The problem is essentially that of a source of radio interference that can either be radiated directly, or conducted down the line and re-radiated along all or parts of the line. Theoretically, to understand this phenomenon, it is necessary to have background in the propagation of waves and antenna theory (the line acts as an antenna) which includes a knowledge of electromagnetic theory, itself based on partial differential equations and vector analysis. This report represents a summary of the essential parts of the theory to give the necessary initial background. Prior contact with the elements of the theory is assumed and although many of the relationships have been explored fully, the more rigid mathematical proofs are not stated but referenced to standard books on the subject.

PB 154 309 $1.60

Washington Square [Coll.] New York U., N. Y.
RESEARCH AND DEVELOPMENT FOR THE STUDY OF THE STORAGE OF ELECTRICAL ENERGY WITH THE HELP OF PERSISTENT INTERNAL POLARIZATION IN PHOSPHORS, by Hartmut Kallmann and Joseph Rennert. Progress rept. no. 2, 15 Sep-30 Nov 60, on Contract DA 30-069-ORD-3075. Dec 60, 14p; AD-249 983.

DESCRIPTORS: *Polarization, *Phosphors, Zinc compounds, Cadmium compounds, Sulfides, Electrical effects, Energy, Storage, Electrical equipment, *Low temperature research.

Open-ended Terms: PIP.

An improved technique for dehydrating p. i. p. layers was developed. This results in about a 3-fold enhancement of p. i. p. charge storage over samples made earlier as well as an excellent reproducibility of the p. i. p. properties of the layer. Under ambient room temperature conditions p. i. p. in these layers was studied as a function of the following parameters: polarizing time, polarizing radiation intensity, and applied polarizing voltage. Furthermore dark polarization and infrared quenching and the kinetics of the dark decay of polarization were studied as well as the light release of p. i. p. as a function of incident intensity. The results obtained were compared with those of earlier investigators and the sample housing and measuring equipment were checked out for p. i. p. studies at low temperatures. (Author)

Electronics

PB 154 563 $1.10

Advanced Kinetics, Inc. [Santa Ana, Calif.]
PRODUCTION OF MILLIMETER AND SUB-MILLIMETER ELECTROMAGNETIC WAVES BY THE INTERACTION OF PLASMA AND ELECTRON BEAMS WITH HIGH INTENSITY PULSED MAGNETS, by Ralph W. Waniek. Quarterly scientific rept. no. 2, 16 Oct 60-15 Jan 61, on Contract AF 19(604)7406. [1961] 6p. 2 refs. AFCRL-22; AD-250 857.

DESCRIPTORS: Bremsstrahlung, Production, *Electromagnetic waves, *Plasma physics, Electron beams, *Magnets, Microwaves, Magnetic fields, Radiofrequency pulses.

Problems connected with the injunction of electrons into magnetic fields were investigated. The theoretical basis was established for the analysis of bunch spreading in the beam. An attempt was made at exploring methods of determining analytically the coherence of the radiation emitted. The experimental activity was directed at testing the equipment. Capacitor bank and high-field magnet were taken in operation and some difficulties were experienced with the high current switching system. Initial experiments of beam formation and extraction were performed with D. C. fields. (Author) (See also PB 153 732)

PB 154 363 $6.60

Electronics Research Lab., U. of California, Berkeley.
ON THE PERIODIC MODES OF OSCILLATIONS IN PULSE-WIDTH-MODULATED FEEDBACK SYSTEMS, by E. I. Jury and T. Nishimura. Rept. on Contract AF 18(600)1521. 29 Nov 60, 66p. 18 refs. IER Series no. 60, issue no. 328; AFOSR TN-60-1474; AD-250 343.

DESCRIPTORS: *Pulse modulation, Mathematical analysis, Theory, Stability, Oscillation.

A general procedure for obtaining information on the periodic modes of oscillation in PWM and nonlinear sampled-data feedback systems is considered. Based on the equivalence of PWM in the state of limit cycles to the finite pulsed systems with the periodically varying sampling pattern, the methods of analysis applied to the latter are extended to obtain these limit cycles. In particular, the final value theorem is applied to obtain the fundamental response equation which gives rise to the limit cycles for the various specified modes. The theory is applied to systems with and without integrator and the results are checked by the phase-plane approach. Three kinds of nonlinearities, namely, pulse-width modulation, relay, and saturating gain, are discussed among the various nonlinearities, and examples are presented for each of these cases. Furthermore, both self-excited and forced oscillations are examined as well as the possible existence of limit cycles for certain specified modes. (Author)

PB 154 125 $3.60

Stanford Electronics Labs., Stanford U., Calif.
TOLERANCE THEORY OF LARGE ANTENNAS, by R. N. Bracewell. Scientific rept. no. 5 on Contract AF 18(603)53. 21 Nov 60, 32p. 4 refs. Stanford Radio Astronomy Institute Publication no. 5; AFOSR-TN-60-1408; AD-249 514.

DESCRIPTORS: *Antennas, Theory, *Antenna radiation patterns, *Parabolic antennas, Errors.

The design of an antenna calls for definite amplitudes and phases of the currents but when the antenna has been constructed and adjusted there will be departures from the design currents due to several causes. It is therefore desirable that the theory of antenna tolerances be pursued. The effects are presented of systematic and random errors on the radiation pattern of antennas representable by a field distribution over an aperture, such as paraboloidal reflectors and large arrays of small elements. In the case of paraboloids, the deterioration in directivity is found to depend on the mean square departure of the surface from the paraboloid of best weighted least-squares fit and on the two-dimensional autocorrelation function of the departure. The variation of directivity with wavelength of a particular paraboloid is deduced by leaving out of account those two-dimensional Fourier components of the departure with spatial periods less than a wavelength. Practical steps are considered for unifying testing, adjusting and design so as to lead to the greatest relaxation of the mechanical tolerances imposed on construction. (Author)

PB 154 442 $8.10

Technische Hochschule, Vienna (Austria).
HYDRODYNAMICAL TREATMENT OF ELECTRON FLOW, by H. Pötzl, K. Richter, and K. Tögel. Annual technical rept. ATR no. 2, 1 Dec 59-30 Nov 60, on Contract DA 91-591-EUC-1312. 31 Jan 61, 87p. 24 refs. AD-250 884.

DESCRIPTORS: Hydrodynamics, *Electrons, *Diodes, Electric fields, Magnetic fields, *Space charges, Admittance, Mathematical analysis, *Electron charge, Theory.

The treatment of electron flow, taking into account both space charge forces and thermal velocity distribution, is discussed. Results of an investigation are presented which has the aim of finding and checking approximation methods for the case of a plane parallel diode in a longitudinal electric field. The method begins with the solution of the Boltzmann equation for low and for high frequencies. The behavior of the flow for arbitrary frequencies is approximately described by a combination of both results. A similar method was applied Siegman and Bloom Trans. I. R. E., ED-4:295-299, Oct. 1957 in deriving the equivalent circuit for noise convection current in the potential minimum of a space-charge limited diode. The application of this method to the exponential region of diode operation leads to an equivalent circuit for the diode admittance which provides good agreement with experimental results. It also covers in a satisfactory manner the limiting case in which space charge forces can be neglected. Although it has not been possible to complete a similar approach for the space-charge limited region, the results promise a simplified and physically obvious theory of diode flow. (Author)

PB 154 001 $2.60

Visibility Lab., U. of Californai, San Diego,
MULTIPLIER PHOTOTUBE SECONDARY EMISSION CHARACTERISTICS, by Richard L. Ensminger. Rept. on Contract NObs-72092. Mar 59, 26p. 7 refs. S10 Ref. 59-11; AD-213 773.

DESCRIPTORS: *Photomultipliers, * Secondary emission, *Curve fitting, Series.

This paper suggests a method for fitting the secondary emission characteristic of multiplier phototubes to a general equation for secondary emission from metalic surfaces. An analysis of this equation affords an explanation of the observed fact that multiplier phototube gain is proportional to the n-th power of the dynode supply voltage over a limited range. The technique followed was to develop an approximate form of the theoretical secondary emission characteristic, and then to correlate this analysis with an experimental determination of this characteristic for a specific 931-A multiplier phototube. (Author)

Molecular Physics and Spectroscopy

ANL-6318 $2.00

Argonne National Lab., Ill.
MONTECARLO CALCULATION OF THE ENERGY LOSS SPECTRA FOR GAMMA RAYS IN SODIUM IODIDE AND CESIUM IODIDE, by W. F. Miller and William J. Snow. Rept. on Contract W-31-109-eng-38, Feb 61, 83p.

PB 171 718 $0.50

Bureau of Naval Weapons, Washington, D. C.
INFRARED RADIATION POINT REFERENCE SOURCES. BuWeps-BuShips Calibration Program. 15 July 60, 31p. Secondary Standards Lab. Instrument Calibration Procedure MR-02.

DESCRIPTORS: *Infrared radiation, Sources, Intensity, *Calibration, Temperature control, Instruction manuals, Instrumentation.

The Secondary Standard Infrared Calibration System provides a versatile means of calibrating test sources of infrared energy by radiometric comparison against a reference source whose radiation characteristics are accurately known. The system operates on an AC null principle. The primary mode of operation, which also provides the most accurate method of calibration, is simultaneous comparison of the radiant flux from test and reference sources by alternately imaging the radiation from their respective apertures on a single detector.

PB 171 717 $0.50

Bureau of Naval Weapons, Washington, D. C.
INFRARED RADIATION REFERENCE SOURCE BARNES ENGINEERING MODEL RS-6A. BuWeps-BuShips Calibration Program. 25 July 60, 33p. Secondary Standard Lab. Instrument Calibration Procedure MR-01.

DESCRIPTORS: Infrared radiation, Sources, Intensity, *Calibration, Instruction manuals, Temperature control, Instrumentation.

Open-ended Terms: RS-6A.

The Secondary Standard Infrared Calibration System provides a versatile means of calibrating test sources of infrared energy by radiometric comparison against a reference source whose radiation characteristics are accurately known. The system operates on an AC null principle. The primary mode of operation, which also provides the most accurate method of calibration, is simultaneous comparison of the radiant flux from test and reference sources by alternately imaging the radiation from their respective apertures on a single detector.

PB 171 277 $2.00

Geophysics Corp. of America, Bedford, Mass.
MOLECULAR DIFFUSION, by R. Papa. Rept. on Contract AF 19(604)7405. Jan 61, 73p. 6 refs. GCA Technical rept. 61-6-A; AFCRL 106; AD-252 535.

DESCRIPTORS: *Molecules, *Diffusion, *Gases, Theory, *Quantum mechanics, *Ions, Velocity, Statistical functions, Electric fields.

The Chapman-Enskog method of correcting the velocity distribution function is found to be applicable in the case of the mutual diffusion of two neutral gases and also in the case of diffusion of ions in a neutral gas under the influence of an electric field. In both cases, the diffusion cross section may be calculated according to classical theory and quantum theory. The theoretical predictions are compared with experimental data. Also, data are included for drift velocities of various ions as a function of field strength divided by pressure. Finally, the interaction of diffusing ions of different sign is investigated. An ambipolar diffusion coefficient may be defined when there is no magnetic field present and the plasma conductivity is either small or large.

PB 147 938 $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
SPIN ECHO RESONANCE, by D. E. Kaplan. Annual status rept. no. 2 on Contract Nonr-2541(00). 1 Apr 60, 37p. 21 refs. LMSD-703 003; AD-237 803.

DESCRIPTORS: *Radiofrequency spectrum analyzers, *Paramagnetic resonance, *Data storage systems, Microwave equipment, Nuclear spins, Electronic circuits, Free radicals.

Theoretical and experimental aspects of serial information storage at microwave frequencies in electron spin systems using magnetic-resonance spin echo techniques are discussed. Estimates of the storage capacity of a practical system are obtained. Details of a pulsed electron paramagnetic resonance spectrometer designed for information storage investigations are described and experimental results obtained during the preceeding contractual year are reported. (Author) (See also PB 145 735)

TID-7594 $3.50

Oak Ridge National Lab., Tenn.
PROCEEDINGS OF THE TOTAL ABSORPTION GAMMA-RAY SPECTROMETRY SYMPOSIUM, GATLINBURG, TENNESSEE, MAY 10-11, 1960, 253p.

PB 154 079 $1.60

Queen Mary Coll., U. of London (Gt. Brit.)
THE STUDY OF THE FREE-RADICAL INTERMEDIATES FORMED DURING THE OXIDATION OF ORGANIC MESOMERIC COMPOUNDS BY METAL IONS IN SOLUTION BY MEANS OF ELECTRON SPIN RESONANCE SPECTROSCOPY. Annual technical rept. for 1 Oct 59-30 Sep 60 on Contract DA 91-591-EUC-1310. [1960] 19p. AD-249 370.

DESCRIPTORS: *Free radicals, *Spectrographic analysis, *Organic compounds, Quinones, Phenols, Oxidation, Transition elements, Ions, Electrons, Spin, Resonance, Hyperfine structure, Chemical reactions, Metals.

The oxidation of organic compounds by compounds of the transition metals is investigated. In these reactions free-radicals are often postulated as intermediates and a sensitive electron-spin resonance spectrometer for the detection of such radicals was constructed. The spectrometer was used to study the oxidation of 2:6-ditertiary butylphenol in alkaline solution, and also the oxidation of hydroquinones to protonated semiquinone radicals in concentrated sulphuric acid. (Author)

PB 154 352 $8.10

Theoretical Chemistry Lab., Indiana U., Bloomington.
ELECTRONIC STRUCTURE OF THE GROUND STATE OF THE LITHIUM HYDRIDE MOLECULE, by Darrell D. Ebbing. Rept. on Contract AF 49(638)318. 1 Sep 60, 85p. 60 refs. AFOSR TN-60-1131; AD-249 986.

DESCRIPTORS: *Lithium compounds, *Hydrides, *Atomic structure, *Molecules, Atomic orbitals, Quantum mechanics, Configuration, Digital computers, Programming.

A set of orbitals in elliptical coordinates has been used as basis in a self-consistent field configuration interaction (SCF-CI) study of the electronic structure of the ground state of the lithium hydride molecule. The results of each configuration interaction calculation have been analyzed into contributions to the inner shell and outer-shell correlation energies and in this way the importance of various orbitals is studied and related to correlation effects. The importance of various configurations is also studied and it is found that those configurations are most important which have either the inner-shell molecular orbital or the valence-shell molecular orbital doubly occupied. In contradiction to second-order perturbation theory, it is found that some singly-excited configurations are very important. The best energy obtained, using 53 configurations formed from a basis of 7 sigma and 3 pi orbitals, is -8.04128 Hartrees at an internuclear separation of 2.99 Bohr radii. The dipole moment was calculated to be 5.96 Debyes. It is concluded that the SCF-CI approach leads itself well to the study of the electronic wave function of a molecule and provides a CI expansion which is rather rapidly convergent. (Author)

Optics

PB 171 382 $0.75

Aeronautical Research Lab., Air Forces Research Div., Wright-Patterson AFB, Ohio.
THE LIMITATIONS IN RESOLUTION AND DISCRIMINATION IN BRIGHTNESS DIFFERENCES FOR LIGHT AMPLIFIER SYSTEMS USING CONTRAST ENHANCEMENT, by Radames K. H. Gebel. Rept. on Research on the Quantum Nature of Light. Jan 61, 26p. 15 refs. ARL-12.

DESCRIPTORS: *Optical systems, *Amplifiers, *Light, Brightness, *Resolution, Optics, Quantum mechanics.

The ultimate limitations in resolution and discrimination of brightness differences, determined by the quantum nature of light, at low light level observations with a light amplifier imaging system using contrast enhancement are treated herein. Simple equations are derived and the limiting situations are displayed by several graphs. The resolution achieved with an experimental tube is compared with the theoretically possible resolution. The low light level performance in contrast discrimination of the unaided human eye is inferior in comparison to the theoretical limitations of a light amplifier system that is possible by the present state-of-the-art. (Author)

PB 154 034 $1.60

Duntley, S. Q., La Jolla, Calif.
DAYTIME VISIBILITY OF STARS BY THE HIGH ALTITUDE OBSERVER. PART II: OPTICAL ENHANCEMENT BY FILTERS, POLARIZERS AND MAGNIFIERS, by John H. Taylor. Rept. no. 5-9 on Contract NObs-72039, Task 5. June 60, 15p. 8 refs; AD-251 743.

DESCRIPTORS: *Celestial navigation, Stars, *Visibility, Optical filters, Polariscopes, Telescopes, Binoculars, Tests, High altitude flight, Optical instruments, *Sky brightness.

The enhancement effects of color filters, polarizers and magnifiers for use by the high altitude observer attempting to perform celestial navigation by use of stars in the daytime zenith sky was investigated. An experiment was performed to determine the gain to be expected by the use of two commercially-available filters, and the possible benefits of polarizers and magnification devices have been calculated. Color filters chosen to darken the blue sky background were found experimentally to give an advantage of only 0.6 of a stellar magnitude. Polarizers were computed to have an enhancement effect productive of less than one-half of a stellar magnitude at the altitude of interest (50 000 feet). Magnification by telescopes or binoculars was shown to give a gain proportional to the common logarithm of the power, but instruments of sufficient magnification tend to have restricted fields of view which partially vitiates the benefit of the gain in flux. (Author)

PB 154 031 $1.10

Duntley, S. Q., La Jolla, Calif.
DERIVATION OF THE CONTRAST REDUCTION EQUATION, by S. Q. Duntley. Rept. no. 5-6 on Contract NObs-72039. June 60, 5p. 5 refs. AD-251 741.

DESCRIPTORS: *Underwater objects, *Visibility, *Sea water, *Light transmission, *Light, Differential equations, Theory, Nomographs.

When the path of sight is entirely within a uniform stratum of natural water, the spectral radiance measured at depth z_1 by a radiance photometer pointed in a direction having zenith angle Θ and azimuth angle ϕ is found to be related to the corresponding spectral radiance at depth Z_2 by an approximation. The mathematical model introduces the justifiable approximation that the radiance K-function (attenuation coefficient) is the same at all points throughout the path of sight. (Author)

PB 154 025 $1.10

Duntley, S. Q., La Jolla, Calif.
EXAMPLES OF WATER CLARITY DATA. Rept. no. 3-7 on Contract NObs-72039. May 59, 5p. 2 refs. AD-228 653.

DESCRIPTORS: Water, *Underwater objects, Visibility, *Oceanographical data.

PB 154 027 $1.60

Duntley, S. Q., La Jolla, Calif.
FLIGHT TESTS OF AN AIRBORNE LIGHT-SCATTERING REFRACTOMETER. Rept. no. 4-1 on Contract NObs-72039. June 60, 19p. 7 refs. AD-251 740.

DESCRIPTORS: **Refractometers, Flight testing, Airborne, *Atmospheric refraction, Haze, Detection, Light, Scattering.

This instrument, designed for radiosonde application, is intended to detect tenuous haze layers in the atmosphere by means of optical scattering and, by correlation, enable profiles of microwave refractive modulus to be generated. The instrument was flight-tested on two occasions.

PB 154 028 $2.60

Duntley, S. Q., La Jolla, Calif.
GENERAL ANALYTICAL REPRESENTATIONS OF THE OBSERVABLE REFLECTANCE FUNCTION, by Rudolph W. Preisendorfer. Rept. no. 5-1 on Contract NObs-72039. Nov 59, 30p. 8 refs. AD-231 558.

DESCRIPTORS: Water, Light transmission, *Light, *Reflection, Scattering, Diffraction, Mathematical analysis, *Differential equations, *Integral equations, Series.

Differential and integral formulas governing the observable reflectance function $R(\cdot,-)$ are developed. Methods of using the formulas are outlined. $R(\cdot,-)$ may be obtained directly without first solving for the irradiance functions. The methods are general enough to allow the determination of $R(\cdot,-)$ if the absorption and backward scattering functions for each stream in an arbitrarily inhomogeneous stratified medium are known. A general equilibrium-seeking theorem for $R(\cdot,-)$ is also demonstrated, the substance of which is the fact that the derivative of $R(\cdot,-)$ at each depth Z invariably has an algebraic sign so as to decrease the absolute magnitude of the difference $R(Z,-)-Rq(Z,-)$ between $R(Z,-)$ and the value $Rq(Z,-)$ of the equilibrium reflectance function. (Author)

PB 154 029 $6.60

Duntley, S. Q., La Jolla, Calif.
IMPROVED NOMOGRAPHS FOR CALCULATING VISIBILITY BY SWIMMERS (NATURAL LIGHT). Rept. no. 5-3 on Contract NObs-72039. Feb 60, 64p. 2 refs. AD-241 308.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Swimming, *Visibility, *Underwater objects, *Nomographs, Determination, Sun, Water, Light, Light transmission.

Contents: Selection of the proper chart: Natural illumination; Effect of depth and water clarity; Stratified water; Effect of sea-state; Examples; Adaptation level; Inclination factor; Bottom influence; Calculation of adaptation luminance; Chart selection. Using the nomographs: Objects on the bottom; Object size and shape; Vertical path of sight; Inclined paths of sight; The secchi disk; Target markings; The measurement of target reflectance; Horizontal paths of sight; The R_{oo} correction; Correction of the sighting range. Interpretation of sighting range: Effect of lack of warning; Effect of observer training; Effect of observer visual capability. Visualization of water clarity: Estimation of sighting range; Estimation of adaptation luminance; Estimation of a and K; Characterization of natural waters

PB 154 036 $2.60

Duntley, S. Q., La Jolla, Calif.
MEASUREMENTS OF THE TRANSMISSION OF LIGHT FROM AN UNDERWATER POINT SOURCE, by S. Q. Duntley. Rept. no. 5-11 on Contract NObs-72039, Task 5. Oct 60, 22p. AD-251 744.

DESCRIPTORS: *Water, *Light transmission, Measurement, Optical instruments, *Energy, *Light.

Open-ended Terms: Radiative transfer.

Underwater measurements of the transmission of light from a submerged uniform point source are described and compared with the predictions of certain simple equations. Although the data relate only to a single example of natural water they conform with certain general principles, so that applicability of the results to most natural waters is probable. (Author)

PB 154 149-2 $18.00

Lockhead Aircraft Corp., Sunnyvale, Calif.
GENERAL RESEARCH IN DIFFRACTION THEORY VOLUME 2. SUPPLEMENTARY TABLES AND FIGURES RELATED TO A CLASS OF DIFFRACTION INTEGRALS, by Nelson A. Logan, Technical rept. on Physical Electronics. Dec 59, 285p. LMSD-288 088; AD-243 182.

DESCRIPTORS: *Diffraction, Theory, Tables, *Reflection, *Attenuation, Integrals.

The tables and figures supplement the theoretical results presented in the first volume of this series. The functions tabulated can be used to study diffraction effects when (1) source and receiver are on the surface, (2) source (or receiver) is on the surface and the receiver (or the source) is at a great distance, and (3) both source and receiver are at a great distance. (Author)

PB 154 009 $9.60

Visibility Lab., U. of California, San Diego.
ATMOSPHERIC OPTICAL MEASUREMENTS DURING HIGH ALTITUDE BALLOON FLIGHT, PART I, by Almerian R. Boileau. Rept. on Contract NObs-72092. Dec 59, 115p. 2 refs. SIO Ref. 59-32-(1); AD-241 255.

DESCRIPTORS: *Atmosphere, *Optical analysis, Meteorological balloons, Optical instruments, High altitude, *Luminescence, Optical images, Transmission.

Included in the report is:
Image transmission by the troposphere I, by Seibert Q. Duntley, Almerian R. Boileau, and Rudolph W. Preisendorfer, pub. in the Jnl. of the Optical Soceity of America, 47: 499-506, June 57.

Certain optical measurements of the atmosphere were made over central Minnesota. These were recorded from day-break to mid-morning during the time four optically instrumented balloons recorded related data at a higher altitude. The data recorded are presented as a catalogue of the recorded optical measurements as they varied with altitude, time of day, azimuthal angle with respect to the sun, and meteorological conditions. (Author)

PB 154 054 $8.60

Visibility Lab., U. of California, San Diego.
ATMOSPHERIC OPTICAL MEASUREMENTS IN WESTERN FLORIDA, FLIGHT 112. PART III. SKY RADIANCES (BLUE) by Almerian R. Boileau. Rept. on Contract NObs-72092. Nov 60, 92p. 2 refs. S10 Ref. 60-55; AD-251 827.

DESCRIPTORS: Atmospheric refraction, *Sky brightness, Florida, *Optical images, *Light transmission, Measurement, Instrumentation, Light, *Energy.

This report presents the sky radiance distribution as measured by a blue light sensitive filter - phototube combination, and shows how it varied with altitude, zenith angle, and azimuth with respect to the sun.

PB 154 052 $7.60

Visibility Lab., U. of California, San Diego.
A COMPUTER TREATMENT OF RADIATIVE TRANSFER ON A CUBIC LATTICE (PLANE SOURCES) by William Hadley Richardson and Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. June 60, 79p. 10 refs. SIO Ref. 60-46.

DESCRIPTORS: Digital computers, Atmosphere, *Light transmission, *Light, *Visibility, Lattices, Reflection Optics, Geophysics, *Energy.

Open-ended Terms: *Radiative transfer.

Between two extreme methods of analysis lies a large, relatively unexplored collection of analytic techniques of intermediate delicacy and incisiveness which may be used to coax a store of answers from the radiative transfer equation. The purpose of this report is to study the numerical application of one such technique. This technique is called discrete-space radiative transfer theory.

PB 154 012 $3.60

Visibility Lab., U. of California, San Diego.
THE COVARIATION OF THE DIFFUSE ATTENUATION AND DISTRIBUTION FUNCTIONS IN PLANE PARALLEL MEDIA, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. July 59, 36p. 5 refs. SIO Ref. 59-52, AD-231 627.

DESCRIPTORS: Water, Light transmission, *Light, Diffusion, Attenuation, Mathematical analysis, Statistical functions.

The following theorem is presented: at arbitrary fixed depths Z, the diffuse attenuation function value K(Z, -) and the distribution function value D(Z, -) vary directly (but not necessarily linearly) one with the other, in all steady state real plane-parallel media which are predominantly forward scattering. A criterion for the behavior of K(Z, -) in terms of the intuitively simpler concept D(Z, -) is established. The physical significance of K(Z, -) and D(Z, -) is also discussed. (Author)

PB 153 990 $1.60

Visibility Lab., U. of California, San Diego.
THE DIVERGENCE OF THE LIGHT FIELD IN OPTICAL MEDIA, by R. W. Preisendorfer. Rept. on Contract NObs-72092. 26 July 57, 17p. 9 refs. S10 Ref. 58-41; AD-247 620.

DESCRIPTORS: *Light, Light transmission, Reflection, *Absorption, Optics, Aerosols, *Hydrology, Determination, Volume, Meteorology, *Energy.

Open-ended Terms: Radiative transfer.

The most general relation for the divergence of the light vector is derived from the equation of transfer for an arbitrary optical medium, and is shown to yield a direct means of determining the volume absorption function in natural aerosols and hydrosols. It is also shown that a correct special form of the divergence relation (for the slab geometry) is derivable from the classical Shuster equations and their solutions. (Author)

PB 154 050 $3.60

Visibility Lab., U. of California, San Diego.
FEASIBILITY STUDY OF A PHOTOELECTRIC SYSTEM FOR DETECTION OF DOWNED AVIATORS, by Richard L. Ensminger and James L. Harris. Rept. on Contract NObs-72092. June 60, 32p. 4 refs. SIO Ref. 60-45; AD-251 825.

DESCRIPTORS: *Air sea rescues, Detection, *Photoelectric target seekers, Aviation personnel, Visibility, Visual acuity.

The function of a photoelectric system should be to improve upon the performance capabilities of unaided visual search. This report starts with a very brief analysis of the visual detection capability. Succeeding sections of the report discuss each parameter of the search geometry and indicate, where possible, modification of the parameter which will lead to improved performance. The final sections describe a photoelectric system capable of incorporating the improvements indicated and capable of day and night operation at a performance level surpassing the specified Navy requirements.

PB 154 010 $2.60

Visibility Lab., U. of California, San Diego.
FIELD TEST OF A SYSTEM FOR PREDICTING VISIBILITY BY SWIMMERS FROM MEASUREMENTS OF THE CLARITY OF NATURAL WATERS, by S. Q. Duntley, J. E. Tyler, and J. H. Taylor. Rept. on Contract NObs-72092. June 59, 23p. 8 refs. SIO Ref. 59-39; AD-220 356.

DESCRIPTORS: *Underwater objects, *Visibility, Sea water, Light transmission, *Light, Attenuation.

A field test was made of the validity of the water clarity meter and nomographic charts for the interpretation of its readings. An a-measuring equipment was used for the field test which embodied the same basic optical design as the water clarity meter. The K-measuring portion of the meter was a physically separate unit. The coefficient K was determined by measuring the vertical gradient of downwelling irradiance, by means of an upward-facing photovoltaic cell covered by a matte-surfaced diffusing plate. Contrast reduction was measured by means of an underwater photoelectric telephotometer in a carefully prepared perturbation-minimized mounting and compared with values predicted by theory on the basis of data from the water clarity meter. All of the data are of excellent agreement constituting experimental evidence that; (1) the water clarity meter provides values of the water clarity constants, a and K, which are valid for predicting the apparent contrast, of underwater objects by means of the specified contrast of underwater objects by means of the specified equation, and (2) the sighting ranges predicted by the nomographic charts are valid when based upon values of a and K from the water clarity meter.

PB 154 044 $5.60

Visibility Lab., U. of California, San Diego.
INSTRUMENTATION FOR THE MEASUREMENT OF THE UNDERWATER LIGHT FIELD AND THE DETERMINATION OF THE OPTICAL PROPERTIES OF THE SEA, by John E. Tyler. Rept. on Contract NObs-72092. May 60, 52p. 45 refs. SIO Ref. 60-24; AD-241 371.

DESCRIPTORS: *Sea water, *Optical analysis, Light, Scattering, Visibility, Measurement, Instrumentation, Photometers.

Contents:
Radiance distribution
Attenuation coefficient
Volume scattering functions and total scattering coefficient
Irradiance
Diffuse attenuation function and reflectance function
Monochromatic data for the diffuse attenuation function
Scalar irradiance (spherical irradiance)
Absorption coefficient
Path function
Applications for light measurements in the ocean
Descriptive oceanography and other geophysical applications
Photosynthesis and other biological phenoma
Image recording equipment.

PB 154 055 $2.60

Visibility Lab., U. of California, San Diego.
MEASUREMENTS OF THE TRANSMISSION OF LIGHT FROM AN UNDERWATER SOURCE HAVING VARIABLE BEAM-SPREAD, by S. Q. Duntley. Rept. on Contract NObs-72092. Nov 60, 24p. 2 refs. SIO Ref. 60-57; AD-251 829.

DESCRIPTORS: Water, *Light transmission, *Light, *Underwater objects, *Visibility, Measurement, Mathematical analysis, Optics, *Energy.

Open-ended Terms: Radiative transfer.

The present report describes underwater measurements of the transmission of light from a submerged source of variable beam-spread. Angular beam-widths down to 20^{o} were used. Equations were derived for irradiance due to sources producing uniform circular light beams of total plane angular width $\theta \geq 20^{o}$. An important implication of the foregoing equations is that, from the standpoint of efficiency, underwater lighting systems should employ narrow-beam sources to the maximum extent practicable, even at ranges so great that the monopath transmission is negligible.

PB 154 004 $2.60

Visibility Lab., U. of California, San Diego.
ON GROUND-BASED MEASUREMENTS OF THE OPTICAL PROPERTIES OF THE ATMOSPHERE ALOFT, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. Mar 59, 23p. 5 refs. SIO Ref. 59-19; AD-215 891.

DESCRIPTORS: *Atmosphere, *Optical analysis, Optical images, Transmission, Optical instruments, Light, Light transmission.

The study of image transmission through the atmosphere is continued. For any given subregion X of the atmosphere and any given object Y in X, the physical factor involved in image transmission calculations are restricted to 3 factors: (1) the radiance distribution N(x, .) at each point x of X, (2) the values $\alpha(x)$ of the volume attenuation function at each point x of X, and (3) the inherent radiance distribution $N_o(Y, .)$ at each point y of Y. The study is primarily devoted to

the determination of $\alpha(x)$ at all points in X from a fixed vantage point in X. A possible solution is suggested to the problem of determining α-values of the atmosphere aloft from the ground. The justification of the choice of the factors is presented. Further information that can be derived from the knowledge of $N(x.,)$ and $\alpha(x)$ is also investigated.

PB 154 011 $1.60

Visibility Lab., U. of California, San Diego.
ON THE DIRECT MEASUREMENT OF THE TOTAL SCATTERING FUNCTION, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. July 59, 11p. 3 refs. SIO Ref. 59-41; AD-228 698.

DESCRIPTORS: *Light, Absorption, Scattering, Measurement, Mathematical analysis, Optical analysis.

The general method outlined will be applicable to any scattering medium, but perhaps its greatest use will be found in the experimental study of natural hydrosols

PB 154 007 $1.60

Visibility Lab., U. of California, San Diego.
PHOTOMETRY DURING MANHIGH III BALLOON FLIGHT, by A. R. Boileau and S. Q. Duntley. Rept. on Contract NObs-72092. Apr 59, 11p. SIO Ref. 59-25; AD-215-893.

DESCRIPTORS: *Sky brightness, Infrared spectroscopy, *Spectrophotometers, *Meteorological balloons, *High altitude flight, Targets, Identification lights, Luminescence.

Open-ended Terms: Manhigh III

The visibility Laboratory participation consisted of (1) Modification of Spectra Brightness Spot Meter, Serial No. 382, by installation of a Bausch & Lomb interference type spectrum wedge to provide spectroradiometric capabilities, and the mounting of a Robot camera bore-sighted with the axis of the instrument to provide positive identification of the small target area whose luminance or radiance was being measured, and (2) communicating with the pilot of the balloon during the flight to advise him as to what sky measurements he should make.

PB 154 014 $3.60

Visibility Lab., U. of California, San Diego.
PRINCIPLES OF INVARIANCE OF DISCRETE SPACES, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. Aug 59, 38p. 8 refs. SIO Ref. 59-55; AD-231 634.

DESCRIPTORS: Water, Light transmission, *Light, *Diffraction, Visibility, Mathematical analysis, Matrix algebra.

The discrete-space approach to radiative transfer theory leads to a derivation of the principles of invariance. The principles of invariance are shown to be derivable by elementary means from the local interaction principle. The principle of local interaction, which describes how radiant flux is scattered and absorbed by a single point of a discrete space X_n, can be rearranged to give the same description for an arbitrary subset of points of X_n. This is called divisibility property of the principle. The principle of invariant imbedding is an immediate consequence, and from this follows the derivation of the principles of invariance. A discussion of 7 outstanding problems of the continuous theory which may be studied using the techniques of discrete-space theory is also included. (Author)

PB 154 005 $1.60

Visibility Lab., U. of California, San Diego.
RADIANCE BOUNDS, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. Mar 59, 16p. 2 refs. SIO Ref. 59-20; AD-214 037.

DESCRIPTORS: *Mathematical prediction, Integral equations, *Light, *Light transmission, *Energy.

Open-ended Terms: Radiative transfer.

PB 154 038 $2.60

Visibility Lab., U. of California, San Diego.
RADIANCE DISTRIBUTION AS A FUNCTION OF DEPTH IN THE SUBMARINE ENVIRONMENT. PART II. OVERCAST LIGHTING WITH TABLES OF RADIANCE -K VALUES FOR BOTH OVERCAST AND SUNNY LIGHTING CONDITIONS, by John E. Tyler. Rept. on Contract NObs-72092. Feb 60, 28p. 1 ref. SIO Ref. no. 60-9; AD-240 678.

DESCRIPTORS: *Visibility, Distribution, Water entry, Light transmission, *Light, Sky, *Sky brightness, Tables.

Detailed radiance distribution data obtained under overcast lighting conditions at the Navy Calibration Station on Lake Pend Oreille, Idaho are presented. Tables of radiance -K values for both the overcast and clear-sunny conditions are also presented.. (Author)

PB 153 971 $3.60

Visibility Lab., U. of California, San Diego.
RADIATIVE TRANSFER AXIOMS, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. 9 Oct 57, 32p. 15 refs. S10 Ref. 57-44; AD-156 349.

DESCRIPTORS: *Light, *Light transmission, Mathematical analysis, Theory, *Energy.

Open-ended Terms: Radiative transfer.

Four axioms are stated from which the salient features of modern radiative transfer theory may be

rigorously deduced. In particular, the various classical attenuating functions and the correct form of the classical homogeneous equation of transfer for radiance (specific intensity) are obtained. The contents of the axioms are called from recurring themes which appear to be common to all discussions of the classical theory. In particular, the axioms summarize and abstract the notions of carrier space, radiative measure, radiative process, and transfer process. The phenomenon of polarization is included in the formalism. Besides introducing new analytical procedures into the radiative transfer theory the axiomatic approach allows some novel connections with other branches of mathematical physics such as the Mueller phenomenological algebra, Maxwell's electromagnetic theory, neutron transport theory, and the theory of stochastic processes. (Author)

PB 154 016 $8.60

Visibility Lab., U. of California, San Diego.
RADIATIVE TRANSFER ON A CUBIC LATTICE, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. Dec 59, 98p. 6 refs. SIO Ref. 59-68; AD-231 632.

DESCRIPTORS: *Light transmission, *Light, Visibility, Algebra, Reflection, Mathematical analysis, Matrix algebra, *Diffraction, *Heat transfer.

An application is presented of the general theory of radiative transfer on discrete spaces to the problem of determining the radiance distributions at each depth in a plane-parallel medium with given external boundary conditions. The cubic lattice which is a discrete-space model of an arbitrarily stratified plane-parallel optical medium is considered. The extended cubic lattice replaces the continuous plane-parallel optical medium by a collection of points located at the centers of contiguous equal cubes contained within 2 parallel planes in Euclidean 3-space. Each cube-center is a point of the lattice and each point may interact radiometrically with its 26 immediate neighbors. The complete 2 boundary, 26-flow problem is solved. The geometrical setting of the problem is defined by using the notion of an extended cubic lattice and its associated quotient space. The principles of invariance are formulated for the lattice, and from these, the requisite equations governing the reflectance and transmittance operators on the lattice are deduced. These operators are then used to express the required internal radiance distributions at each point of the lattice.

PB 154 013 $4.60

Visibility Lab., U. of California, San Diego.
RADIATIVE TRANSFER ON DISCRETE SPACES, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. Aug 59, 49p. 9 refs. SIO Ref. 59-53; AD-228 088.

DESCRIPTORS: *Light, Diffusion, Scattering, Functions, Light transmission.

A study is presented of radiative transfer processes on discrete rather than continuous optical media. The consequences are considered of replacing the usual geometric setting for radiative transfer processes, i.e. some continuum of points in 3 dimensional euclidean space E_3, by a spatially bounded set of points, finite in number, each of which is located in E_3 in accordance with some explicit rule of selection. Each point of the set is then assigned certain scattering and absorbing properties with respect to impinging radiant energy, and each is allowed to interact radiometrically in a specified way with a certain preselected subset of the given collection. Within this context and on a phenomenological level, the problem of the steady state radiance distribution at each point of the set is formulated and solved under prescribed boundary conditions. (Author)

PB 153 995 $3.60

Visibility Lab., U. of California, San Diego.
SOME PRACTICAL CONSEQUENCES OF THE ASYMPTOTIC RADIANCE HYPOTHESIS, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. 1 Sep 58, 32p. 8 refs. S10 Ref. 58-60; AD-206 853.

DESCRIPTORS: *Water, *Light transmission, *Light, Diffusion, Mathematical analysis, *Optics, *Energy.

Open-ended Terms: Radiative transfer.

The asymptotic radiance hypothesis asserts that the angular distribution of radiance approaches a fixed form at great depths in natural waters. A simple proof of this hypothesis is given. The following consequences are deduced: (1) the logarithmic derivatives (with respect to depth z) of radiance values $N(z,\theta,\phi)$ approach, with increasing z, a common fixed value k_∞ for all directions (θ, ϕ); and (2), the logarithmic derivatives of scalar irradiance $h(z)$, its up and downwelling components $H(z,+)$ and $h(z,-)$, along with the derivatives of the up-and downwelling irradiances $H(z,+)$ and $H(z,-)$ all approach the common limit k_∞ as depth increases. Further consequences are that the classical Schuster two-flow equations for the light field in natural waters become exact with increasing depth. A formula is given which allows an estimate of the depth at and below which the actual radiance distributions differ from the asymptotic distribution by no more than a preassigned amount. (Author)

PB 154 046 $1.60

Visibility Lab., U. of California, San Diego.
SOME SPECTRAL SKY RADIANCES WITH DIFFERENT RELATIVE HUMIDITIES, by Almerian R. Boileau. Rept. on Contract NObs-72092. June 60, 18p. 3 refs. SIO Ref. 60-29; AD-251 822.

DESCRIPTORS: *Atmosphere, *Humidity, Atmospheric refraction, *Sky brightness, Infrared spectroscopy, Spectrographic analysis.

Open-ended Terms: Spectrogeograph.

A comparison of six sky spectral radiance measurements for a path of sight 11° above the horizontal after normalization at the maximum value in each

case shows that in the red end of the spectrum the spectral radiance values varied in the same order as the relative humidities varied and, excluding the measurement made during misty weather, the relationship was almost linear. A comparison of the measured spectral radiance curves for the four lowest values of relative humidity shows that there was an almost linear change of sky radiance with change of relative humidity over the range of wavelengths from 480 mμ to 700 mμ. The relative humidities in this discussion were 14%, 37%, 58%, 79%, 83%, and very high (misty). (Author)

PB 154 002 $1.60

Visibility Lab., U. of California, San Diego.
TEMPORAL METRIC SPACES IN RADIATIVE TRANSFER THEORY. IV. TEMPORAL DIAMETERS, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. Mar 59, 18p. 1 ref. S10 Ref. 59-17; AD-214 038.

DESCRIPTORS: *Light, *Light transmission, Mathematical analysis, Theory, *Energy.

Open-ended Terms: Radiative transfer.

PB 154 003 $2.60

Visibility Lab., U. of California, San Diego.
TEMPORAL METRIC SPACES IN RADIATIVE TRANSFER THEORY V. LOCAL TEMPORAL DIAMETERS, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. Mar 59, 21p. 2 refs. SIO Ref. 59-18; AD-214 03

DESCRIPTORS: *Light, Diffraction, *Scattering, Mathematical analysis, Measure theory, *Energy, *Light transmission.

Open-ended Terms: Radiative transfer.

The main emphasis here is on the study of the time-dependent radiant flux problem with the emphasis on basic knowledge rather than immediate applications.

PB 154 018 $8.10

Visibility Lab., U. of California, San Diego.
TWO FUNDAMENTAL METHODS OF SOLVING POINT-SOURCE PROBLEMS IN DISCRETE-SPACE RADIATIVE TRANSFER THEORY, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. Dec 59, 86p. 10 refs. SIO Ref. 59-71; AD-231 556.

DESCRIPTORS: *Light, Light transmission, *Diffraction, Optics, Visibility, *Heat transfer, Mathematical analysis, Topology.

The analytical techniques of discrete-space radiative transfer theory are employed to develop 2 fundamental methods of determining the light field generated by a point source within a given optical medium. A review is presented of examples of point source problems and the motivations for studying them on a discrete-space level. (Author)

PB 154 043 $1.10

Visibility Lab., U. of California, San Diego.
UNDERWATER PHOTOGRAPHY BY ARTIFICIAL LIGHT, by S. Q. Duntley. Status rept. on Contract NObs-72092. Apr 60, 10p. 1 ref. SIO Ref. no. 60-23; AD-251 821.

DESCRIPTORS: *Underwater photography, *Water, *Light transmission, Visibility, Optics.

It is the purpose of this status report to summarize the approach being used to produce improvements in the technique of photography by artificial light. The following topics are presently under active investigation: (1) Precision exposure control, (2) Optimization of underwater lighting, (3) Polarization techniques, (4) Optimum choice of film-filter combination, (5) Prediction of photographic range and coverage in any prevailing water.

PB 154 006 $5.60

Visibility Lab., U. of California, San Diego.
THE UNIVERSAL RADIATIVE TRANSPORT EQUATION, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. Mar 59, 52p. SIO Ref. 59-21; AD-215 892.

DESCRIPTORS: *Light, Diffusion, Integral equations, *Energy, *Light transmission, Mathematical analysis.

Open-ended Terms: Radiative transfer.

The various radiative transport equations used in general radiative transfer theory (for astrophysical and geophysical applications) over the past fifty-four years can be unified by a single transport equation--the universal transport equation. The 34 types of transport equations discussed in this work range from the transfer equation for radiance to the time-dependent transport equation for n-ary scattered radiant energy. Besides serving as a mathematical focal point of unification of the various transport equations, the universal transport equation supplies several new practical results which are beyond the capabilities of the individual standard transport equations for the radiometric concepts; for example, the proofs of the asymptotic theorems about the light field in deep optical media, and the basis for the equilibrium principle (enunciated below). (Author)

PB 154 047 $2.60

Visibility Lab., U. of California, San Diego.
VISUAL CONTRAST THRESHOLDS FOR LARGE TARGETS. PART II. THE CASE OF HIGH ADAPTING LUMINANCES, by John H. Taylor. Rept. on Contract NObs-72092. June 60, 23p. 5 refs. SIO Ref. 60-31; AD-251 823.

DESCRIPTORS: *Visual thresholds, *Targets, *Target recognition, Detection, *Visibility, Luminescence, Configuration.

An experiment was performed which yielded data for both the upper limiting circular target size of the previously used data of the Tiffany research (6°) and for a "split field" in which the target comprised a luminance

increment on one half of the visual field. Six levels of background luminance were studied; those for which the classical data had not reached a terminal value of contrast. The curves of Blackwell have been provisionally extrapolated to limiting contrast asymptotes on the basis of the experimental results.

PB 171 274 $1.25

Washington Square Coll., New York U., N. Y.
A STUDY OF THE FAR INFRARED PROPERTIES OF CRYSTALS, by J. H. Rohrbaugh. Scientific rept. no. 12, 1 June-31 Aug 60, on Contract AF 19(604)2673, continuation of Contracts W28-099-ac-171, AF 19(122)4, and AF 19(604)1115. [1960] 39p. 8 refs. AFCRL TN-60-1140; AD-251 054.

DESCRIPTORS: *Crystals, *Optics, *Infrared optical materials, Scattering, *Electromagnetic waves.

An exact solution has been obtained for scattering of plane electromagnetic waves of arbitrary polarization and arbitrary angle of incidence on an infinitely long metal strip. Previously, exact results have been reported only for the special case of incidence in a plane normal to the axis of the strip. In this special case, the problem may be reduced to a two dimensional solution of the scalar Helmholtz equation. In the general case solution of the vector Helmholtz equation in three dimensions is required. The resulting Mathieu functior expansions involve a parameter which in the special case depends only on the ratio of strip width to wavelength, whereas, in the case of arbitrary incidence, the parameter is a function of the angle between the incident propagation vector and the strip axis as well. Asymptotic expressions have been found for the far field solutions in cylindrical and spherical coordinate representation. (Author) (See also PB 152 624)

Solid State Physics

PB 154 362 $5.60

California U., Los Angeles
STRESS FIELD CAUSED BY A UNIFORMLY SLID CRYSTAL AT THE SURFACE OF AN AGGREGATE, by T. H. Lin and T. K. Tung. Rept. on Contract AF 49(638)20. Oct 60, 52p. 10 refs. Dept. of Engineering rept. no. 60-98; AFOSR TN-60-1387; AD-251 878.

DESCRIPTORS: *Stresses, Mathematical analysis, Single crystals, Deformation, Surfaces, Plasticity, *Lattices, *Crystal structure

A uniform sliding is assumed to occur in a crystal of cubical shape and located at the free surface of a fine-grained polycrystalline aggregate. The face of the cube lies in the free surface. The sliding direction and the sliding plane are assumed to incline 45° with both this top face and a vertical face of the cube. Uniform sliding gives uniform plastic strain in the cubic crystal. It is shown that plastic strain gradient is equivalent to body force in producing stress field. This uniform plastic strain in this cube gives equivalent uniform surface forces on the four faces of the cube. The stress field caused by these surface forces is calculated by means of Papkovitch functions, as given by Mindlin in calculating stresses caused by concentrated forces applied at the interior of a semi-infinite solid. Closed form solutions are obtained for all the stress components. The discontinuity of some stress components across the faces of the cube is discussed. The distribution of stresses caused by this plastically deformed crystal in the aggregate is calculated and shown in graphs. (Author)

PB 154 475 $3.60

David Sarnoff Research Center, Princeton, N. J.
HEXAGONAL MAGNETIC COMPOUNDS, by Robert L. Harvey. Quarterly progress rept. no. 1, 15 Mar-14 June 59, on Contract DA 36-039-sc-78288. AD-225 543.

DESCRIPTORS: *Ferromagnetic materials, *Crystal structure, Magnetic properties, Nickel compounds, Magnetic properties, Nickel compounds, Cobalt compounds, Zinc compounds, Copper compounds, *Oxides, *Metallic crystals.

A study was initiated of compounds having a crystal structure related to magnetoplumbite which are synthetically produced as the reaction products of Fe_2O_3, BaO, and MeO, where Me is the divalent ion of Mn, Fe, Co, Cu, Ni, Zn, or Mg or mixtures of these. A compositional survey was made of unoriented materials in the system $(NiO)_2Y$, $(ZnO)_2Y$, $(CoO)_2Y$. The most desirable properties (at 250 mc) were in the compositional region of $(ZnO)_2Y$ and $(ZnO)_2Y + (NiO)_2Y$. A dc-magnetization study of the degree of orientation indicated that the coercive force in the plane was one-third of that out of the plane. Evaluations were made of unoriented and oriented materials in the frequency range of 80 to 2000 mc. The oriented samples and magnetic resonance in the range 350 to 900 mc. Some of the oriented materials were evaluated in the presence of a dc field. Apparatus is being prepared for measuring electron spin resonance at microwaves.

PB 154 476 $5.60

David Sarnoff Research Center, Princeton, N. J.
HEXAGONAL MAGNETIC COMPOUNDS, by Robert L. Harvey, Irwin Gordon, and R. A. Braden. Quarterly progress rept. no. 2, 15 June-14 Sep 59, on Contract DA 36-039-sc-78288. AD-229 203.

DESCRIPTORS: *Ferromagnetic materials, *Crystal structure, Magnetic properties, Nickel compounds, Cobalt compounds, Zinc compounds, Copper compounds, *Oxides, *Metallic crystals.

Additional compositions in the (Co-Ni-Cu) Y triaxial were prepared; permeability (μ') and Q measurements at 250 mc are presented. The compositions involving Cu and Zn had the highest μ' values. A mechanical device was constructed to provide a smooth

continuous rotation of the mold while in the magnetic field. Improved orientation was indicated for mechani cally orientated samples by permeability and aniso- tropy measurements, but an anomaly was indicated as a result of X-ray reflection studies. X-ray diffraction studies are being made to determine the efficiency of the orientation techniques and to learn the nature of the direction of easy magnetization. An oriented hexagonal material, RCAL no. 6826-39F, was found to have a μ of 25.2 and a Q value of 3.7 when evaluated at 250 mc. The energy (K') required to change the magnetization from the easy plane to the hard direction was increased by the mechanical orientation procedure. An automatic device for plotting the relative permeability as a function of temperature was built and operated. A sample holder was devised for permeability and loss measurements at 100 to 1000 mc which permits measurements to be reproduced to within ±5%. Two test cavities for measurement at 6 kmc are described. (See also PB 154 475)

PB 154 477 $8.10

David Sarnoff Research Center, Princeton, N. J. HEXAGONAL MAGNETIC COMPOUNDS, by Robert L. Harvey, Irwin Gordon, and R. A. Braden. Quarterly progress rept. no. 3, 15 Sep-14 Dec 59, on Contract DA 36-039-sc-78288. AD-232 422.

DESCRIPTORS: *Ferromagnetic crystals, *Crystal structure, Magnetic properties, Nickel compounds, Zinc compounds, Cobalt compounds, Copper compounds, *Oxides, *Metallic crystals.

Synthesis studies on unoriented samples in the Y-type systems were completed with the preparation of 3 compositions within the quaternary system, $(Co\text{-}Ni\text{-}Cu\text{-}Zn)_2Y$. Under no conditions (firing temperature) was the Q of any of these compositions as high as 5. For Z-type compositions, it was considered adequate to delineate the areas in which the planar form exists. Oriented samples having a cylindrical as well as toroidal shapes were also prepared. The possible relationship between the dc magnetization characteristics, the magnetic resonance frequency, and the 2 anisotropy fields is discussed. Additional data are given for the anisotropy constant and the anisotropy field (H_A) for the oriented cubes. For samples evaluated to date, the H_A value varied from about 1400 to 31,000 oersteds. Unoriented Z compounds having various preparations of Co and Zn were evaluated at 13.73 kmc; absorption curves are given for $Co_2 Zn_{1.8} Z$. Microwave measurements of the anisotropy field were made on several samples, the results did not agree with those obtained by the dc method. (See also PB 154 476)

PB 154 478 $6.60

David Sarnoff Research Center, Princeton, N. J. HEXAGONAL MAGNETIC COMPOUNDS, by Robert L. Harvey, Irwin Gordon, and R. A. Braden. Quarterly progress rept. no. 4, 15 Dec 59-14 Mar 60, on Contract DA 36-039-sc-78288. [1960] 61p. 2 refs. AD-236 878.

DESCRIPTORS: *Ferromagnetic materials, *Crystal structure, Magnetic properties, Nickel compounds, Ninc compounds, Cobalt compounds, Copper compounds, *Oxides, *Metallic crystals.

The study of Z-type compositions was completed as nonoriented samples. The most desirable compositions for the standpoint of μ' lie in the Co-Zn system. A number of oriented toroids of the Y and Z types were prepared and measured; preliminary data are given on μ' and Q at 250 mc. Samples of additional compositions were evaluated from the virgin magnetization characteristics from which the anisotropy constant (K') and anisotropy field (H_a) are determined. In some cases, the curve in the difficult direction was essentially a straight line. A tentative conclusion was made that the high order anisotropy constants in the Z compounds are smaller as compared to those in the Y compounds. The temperature-permeability data on the Z compounds showed a change in anisotropy above room temperature and below the Curie temperature. Evaluation of samples (mostly Z compounds) at 250 mc for μ', μ'', and Q showed that the Z compounds have a higher μ' Q product than the Y and W compounds and the oriented compounds are superior to the nonoriented compounds. Measurements of anisotropy field on 7 new samples showed that a significant error occurs if the sample is too close to the waveguide wall. A separation of 1/16 in. is as good as a half wavelength. Isolators were made by using resonance absorption of the ferromagnetic materials; the optimum position of the material in the waveguide was determined by the relation of the orientation axes of the material to the waveguide geometry. (See also PB 154 477)

PB 154 444 $1.60

General Electric Research Lab., Schenectady, N.Y. STUDY OF Li-O INTERACTION IN Si BY ION DRIFT, by E. M. Pell. Scientific rept. no. 6 on Contract AF 19(604)5551. 10 Jan 61, 14p. 7 refs. AFCRL-23; AD-250 671.

DESCRIPTORS: *Ionization, *Lithium, *Ions, Oxygen, Silicon, Crystals, Resistance, Semiconductors, Infrared spectroscopy, Temperature.

Ion drift in a reverse-biased np junction has been used to measure effective drift mobilities of Li(+) between 20 C and 125 C in Si samples containing oxygen concentrations up to 1.3 times 10 to the 18th power atoms/cc. Under such conditions the Li(+) and oxygen will combine to form a complex of the form LiO(+). The ratio of the effective drift mobility of Li(+) in such samples to the known drift mobility of free Li(+), when measured as a function of temperature, can be used to determine the dissociation constant of LiO(+). At high oxygen concentrations the effective drift mobility is found to be inversely proportional to the oxygen concentration, in accordance with the model. The use of this technique for the measurement of oxygen concentrations below 10 to the 17th power atoms/cc is discussed, and some examples of such measurements are given. (Author)

PB 171 273 $0.75

Instituto Elettrotecnico Nazionale "Galileo Ferraris" (Italy).
EFFECT OF X RAY COLORING ON ADDITIVELY COLORED ALKALI HALIDES, by G. Bonfiglioli, P. Brovetto, and C. Cortese. Technical note no. 2 on Study of Traps in Dielectrics by Thermoluminescence Experiments, Contract AF 61(052)328. [1961] 20p. 12 refs. AFOSR 111.

DESCRIPTORS: *Color centers, *Alkali metal compounds, *Halides, Crystals, Dielectrics, *Luminescence, *Conductivity.

The isothermal bleaching of F centers is interpreted as a decay of electrons from conduction levels toward different amounts of different hole centers. A rough calculation suggested that the saturation density of F centers versus irradiation time is caused by the same recombinations that produce thermoluminescence. Spectrophotometric measurements showed that saturation is obtained at a much lower level for an irradiated KI crystal containing V centers previously introduced by stochiometric excess of I_2 than for an irradiated pure KI crystal. An estimate of the recombination term (1.2×10^{-20} cm^3 sec^{-1} at room temperature) supports the interpretation. (See also PB 145 367, PB 136 838, PB 152 451)

PB 171 285 $1.50

Midwest Research Inst., Kansas City, Mo.
RESEARCH ON THE MECHANISMS OF FATIGUE, by J. C. Grosskreutz. Rept. for 1 Mar 59-29 Feb 60 on Solid State Research and Properties of Matter, Contract AF 33(616)6383. Apr 60, 51p. 14 refs. WADD Technical rept. 60-313; AD-247 129.

DESCRIPTORS: *Fatigue (Mechanics), Aluminum, Copper, Single crystals, *Deformation, *Crystal structure, X-ray diffraction analysis, Microphotography.

Continuous observation of the surface of fatiguing samples of utilizing strobe-microphotography confirmed the accumulating evidence that cracks initiate in persistent slip bands. Tapered sections showed that these slip bands correspond to deep notches or fissures. The propagation of the crack is observed to occur along well defined slip systems with the crack jumping from one parallel slip band to another by cross slip. Transverse sections cut through the crack showed that the crack propagates into the volume of the metal from the surface, again via slip planes. The crack is observed to propagate generally perpendicular to the stress axis; with the available slip system, this usually results in a zigzag path. A cloud of slip is observed to precede the crack tip and from this fact and the foregoing data a mechanism of crack propagation is postulated; i. e., crack propagation is a series of reinitiations in persistent slip bands. (Author)

PB 171 267 $2.75

New York State Coll. of Ceramics, Alfred U.
DIFFUSION, CONDUCTION, AND F-CENTER FORMATION IN IONIC SOLIDS. Final technical rept. on Contract AF 18(600)1448: 31 Oct 60, 135p. 91 refs. AFOSR-122; AD-250 851.

DESCRIPTORS: *Color centers, Alkali metal compounds, Halides, Crystals, *Ions, *Conductivity, Diffusion, *Solids, Radiation damage, Ceramic materials.

This program was designed to establish a clearer understanding of the more complex relationships associated with diffusion in ionic solids. An attempt was made to correlate ionic conduction with the defect constitution of the solid, more specifically as affected by the aggregation of impurities at dislocations and other interfaces The rate of formation of F-centers was studied as a function of the thermal history of a variety of pure and controlled-impurity alkali halides, particularly NaCl. At room temperature, the saturation F-center density depended on the intensity of the coloring radiation because of a variation in the fraction of initially present vacancies that can be converted to F-centers by irradiation. The variation was in turn due to the fact that the ability of the irradiation to produce permanent breakup of vacancy complexes depends on the intensity of the radiation.

PB 154 480 $1.60

Radio Corp. of America, Somerville, N. J.
108-mc, 10-watt SILICON TRANSISTORS, by W. A. Bosenberg. Quarterly rept. no. 2, 1 Sep-1 Dec 59, on Contract DA 36-039-sc-78325. [1961] 12p. AD-231 218.

DESCRIPTORS: *Transistors, Production, Electrical properties, Silicon, Tests, Design, Manufacturing methods.

Actual transistors, using a comb structure geometry, were fabricated. A limited number of electrical characteristics of these units were tested and evaluated. Further tests will be conducted when a suitable power oscillator and an amplifier test set are available. It was found that the common emitter current gain increases to about 50 to 350 ma and then shows some fall-off at higher emitter currents. Although the operating conditions are not yet optimized, a power output of 8.6 w at 51 mc and a collector efficiency of 48% were obtained. Problems, such as the forward contact resistance increasing (during high temperature shelf life) for an appreciable percentage of units, were encountered with the gold-silver metallizing process. The feasibility of aluminum metallizing was considered. Adequate precision jigs were constructed. (Author)

PB 154 481 $1.60

Radio Corp. of America, Somerville, N. J.
108-mc, 10-watt SILICON TRANSISTORS, by W. A. Bosenberg. Quarterly rept. no. 3, 1 Dec 59-1 Mar 60, on Contract DA 36-039-sc-78325. [1960] 15p. AD-235 031.

DESCRIPTORS: *Transistors, Production, Electrical properties, Design, Silicon, Tests, Manufacturing methods.

The major engineering effort was directed toward the improvement of processing techniques. Special equipment was designed for improving registration of contact patterns and three metallizing techniques were investigated. The definition of the evaporated wax layers for mesa etching was improved by using etched and electro-polished stainless steel masks. The electrical results as reported in the Second Quarterly Report (PB 154 480) were reproduced during this period but little progress was made in increasing oscillator efficiency. A study for improving the efficiency was continued. (Author)

PB 154 388 $7.60

Research Lab. of Electronics, Mass. Inst. of Tech., [Cambridge]
ON THE STATICS AND DYNAMICS OF MAGNETIC DOMAIN BOUNDARIES, by J. V. Harrington. Rept. on Contracts DA 36-039-sc-64637 and AF 19(122)458. 13 Jan 58, 71p. 40 refs. Technical rept. no. 338; Lincoln Lab. Technical rept. no. 166; AD-110 028.

DESCRIPTORS: *Ferromagnetic materials, *Crystal structure, *Single crystals, Magnetic properties, *Lattices, Mathematical analysis, Resonance, Boundary layer.

A semiclassical analysis of the variation of spin orientation in 180° and 90° domain walls is presented which takes into account both the rotational or latitude angle Θ and the precessional or longitude angle Φ of the macroscopic magnetization vector in ferromagnetic single crystals. The Euler equations for the crystal are derived for both Φ and Θ variations, and solutions of these equations indicate the possibility of a change in spin orientation along a 180° Bloch wall resulting from a precession in Φ. This possibility is verified experimentally by some Bitter powder pattern results in which 180° wall breakup is recorded in a single crystal window frame of silicon iron under the action of a moderate vertically applied magnetic field. Further static solutions of the Euler equation for 360° walls or two adjacent 180° walls of similar rotation driven together by an applied field are obtained. It is shown that when this field is reduced to the order of the coercive force, the equilibrium spacing between 180° walls is about ten wall thicknesses. Some experimental verification of this is obtained from recent observations of Williams (Phys. Rev. 71:646, 1947; 75:155, 1949) on double walls in thin films of nickel iron. By including the kinetic energy term characteristic of gyroscopic motion in the Lagrangian and assuming a Rayleigh dissipation function, the Euler equations for wall motion are obtained. It is shown that the assumption of Rayleigh dissipation leads to a more reasonable variation of wall velocity with losses in the material. (Author)

PB 154 391 $1.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
RESEARCH ON PARAMAGNETIC RESONANCES, by R. L. Kyhl and M. W. P. Strandberg. Quarterly progress rept. no. 4, 15 Apr-15 July 58, on Contract DA 36-039-sc-74895. [1958] 13p. 7 refs.

DESCRIPTORS: *Paramagnetic resonance, *Microwave amplifiers, Phonons, Paramagnetic crystals, *X-band, Amplifiers.

Open-ended Terms: Maser, Versitron.

A solid-state single-cavity X-band maser has been operated with a 20-mc bandwidth at 10 db gain with a bath temperature of 4.2°K. (Previous cavity masers were restricted to small bandwidths.) The present system is tunable from 8400 mc to 9700 mc. The performance of this maser is offered as further experimental support of the phonon saturation mechanism. (Author) (See also PB 147 970)

PB 154 392 $1.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
RESEARCH ON PARAMAGNETIC RESONANCES, by R. L. Kyhl and M. W. P. Strandberg. Quarterly progress rept. no. 7, 15 Feb-15 May 59, on Contract DA 36-039-sc-74895. [1959] 11p.

DESCRIPTORS: *Paramagnetic resonance, *Microwave amplifiers, Paramagnetic crystals, *Resonance absorption, Ultrasonics, Phonons, Chromium.

Open-ended Terms: Maser, Versitron.

An abstract of a paper discussing the problem of the direct acoustic saturation of paramagnetic spins is presented. A summary of work demonstrating discrete phonon transport in paramagnetic crystals is given. A study of the ruby paramagnetic spectrum at 188 mc is also presented in abstract form. (Author) (See also PB 154 391)

PB 154 008 $2.60

Visibility Lab., U. of California, San Diego.
THEORETICAL ASPECTS OF UNDERWATER PHOTOGRAPHY. 1. GRAPHICAL-NUMERICAL CALCULATION OF THE LUMINANCE FIELD ABOUT A SUBMERGED POINT SOURCE, by R. W. Preisendorfer. Rept. on Contract NObs-72092. June 59, 25p. 4 refs. SIO Ref. 59-30; AD-228 697.

DESCRIPTORS: *Underwater photography, Underwater lights, Luminescence, Mathematical analysis, *Theory.

The primary luminance distribution was calculated about a given source submerged in an homogeneous hydrosol with a non-isotropic volume scattering function. The computations were carried out for a given

set of distances from the source, and at each distance the primary luminance was computed for a given range of angles of sight from the observer-source direction. These computations allowed certain specific recommendations to be made as to what film speeds were necessary in order that the field luminance about the given point source be recorded on a photographic plate. (Author)

PB 171 500 $0.50

Watertown Arsenal Labs., Mass.
THE TEMPERATURE COMPENSATED DEBYE TEMPERATURE OF ANNEALED IRON POWDERS, by Charles P. Gazzara and Raymond M. Middleton. Feb 61, 13p. 14 refs. Technical rept. no. WAL TR 811.2/1; AD-252 724.

DESCRIPTORS: *Iron compounds, *Carbonyl radicals, Temperature, Determination, X-ray diffraction analysis, *Powder metallurgy, Powders

The Debye temperature dependent explicit temperature function γ has been found to be 4.1 for annealed carbonyl iron from X-ray diffraction intensity measurements by assuming the static atomic displacement vector to be zero. The corresponding Debye temperature, corrected for temperature diffuse scattering, was calculated to be 435°K at temperature 310°K. (Author)

PB 154 358 $10.10

Westinghouse Electric Corp., Boston, Mass.
STUDY, DEVELOPMENT AND APPLICATION OF TECHNIQUES NECESSARY TO FABRICATE ACTIVE SILICON CARBIDE DEVICES, by Hung-Chi Chang, L. Franklin Wallace, and C. Z. LeMay. Final rept. for 15 Aug 59-15 Oct 60 on Contract AF 19(604)5997., 1 Dec 60, 130p. 16 refs. AFCRL 107; AD-250 299.

DESCRIPTORS: *Silicon compounds, Carbides, *Transistors, Processing, Electrical properties, Crystals, Growth, Semiconductors.

Fundamental techniques were developed for the fabrication of SiC devices in general and unipolar field-effect transistors in particular. The diffusion of Al vapor in alpha-SiC was quantitatively investigated and the diffusion-junction process was developed. Hexagonal SiC was grown in the form of thin platelets which are ready for device fabrication. Device fabrication processes include the single- and double-gate fused junctions, single-gate grown junctions, and single- and double-gate diffused junctions. Only the double-gate diffused junction process produced unipolar transistors which exhibit power gain. These devices are still in a primitive stage of development and will require further development before they become practical devices. An experimental model of a SiC double-gate unipolar transistor was developed that exhibited ac power gain as high as 380 at room temperature and 7 at 500 C.

Theoretical Physics

PB 154 397 $4.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
INVESTIGATION OF MICROWAVE DUPLEXER SWITCHING MECHANISMS, by S. Takeda, M. Roux and others. Quarterly progress rept. no. 4, 1 Dec 59-29 Feb 60, on Contract DA 36-039-sc-78313. 15 Apr 60, 34p. 6 refs; AD-244 914.

DESCRIPTORS: *Radar duplexers, *Switching circuits, *Microwave equipment, Plasma physics, Microwave probes, Shock waves, Tests, Thin films, Indium alloys, Antimony alloys, Intermetallic compounds, Semiconductors, Gas discharges, Mathematical analysis, Cavity resonators, Transmission, Microwaves.

The two probes microwave method, which was used for the determination of the electron density and the collision frequency is extended to the measurement of high electron density up to 10^{16} cm^{-3}. It is based now on the reflection coefficient, which is a time varying complex quantity. Preliminary experiments in a high density plasma, produced by shock waves of high Mach number, yield the time-dependence of the electron density in the decay of that plasma. Research on semiconductor behavior in high level microwave field was continued using resonant cavity techniques at eight millimeter wavelengths. A new cavity was constructed with measured characteristics in closer agreement with theory than before and, having acquired a new magnetron modulator, the microwave circuit was redesigned. The results of measurements on transmission through vacuum-evaporated thin films of indium antimonide are described. (Author) (See also PB 152 561)

PB 171 275 $1.75

Geophysics Corp. of America, Bedford, Mass.
PLASMAS, by R. Papa. Scientific rept. no. 3 on Contract AF 19(604)7405. Jan 61, 65p. 11 refs. GCA Technical rept. 61-11-A; AFCRL 25; AD-252 532.

DESCRIPTORS: *Plasma physics, Mathematical analysis, Gases, *Ionization, *Diffusion, Stability, *Magnetohydrodynamics, *Special functions.

Open-ended Terms: Fokker-Planck equation.

Contents:
The Boltzmann Equation
Methods for solving the Boltzmann Equation
Moments of the Boltzmann Equation
Fokker-Planck Equation
Continuum approach
Waves in a plasma
Classification of magnetohydrodynamic regions
Diffusion in a plasma
Stability of plasmas

PB 171 276 $2.25

Geophysics Corp. of America, Bedford, Mass.
REACTION RATES, by P. J. Nawrocki. Rept. on Contract AF 19(604)7405. Jan 61, 99p. 140 refs. GCA Technical rept. 61-2-A; AFCRL-105; AD-252 534.

DESCRIPTORS: *Quantum mechanics, *Ions, Mass spectroscopy, Gases, *Ionization, *Electrons, *Chemical reactions, *Upper atmosphere.

Open-ended Terms: Recombinations.

Contents:
Introduction
Negative ions
Photo-detachment (O_2^-, O^-)
Attachment
Electron-ion recombination
Charge transfer and charged rearrangement
Three-body ion-ion recombination
Mutual neutralization (two-body ion-ion recombination)
Detachment processes
Tabulated rates

PB 147 172 $2.60

Stevens Inst. of Tech., Hoboken, N. J.
QUASI-CLASSICAL THEORY OF THE SPINNING ELECTRON, by Ralph Schiller. Technical rept. on Contract Nonr-263(30). Apr 60, 21p. 7 refs. SIT-P-3-4/60; AD-236 676.

DESCRIPTORS: Quantum mechanics; Electron transitions.

A generalized Hamilton-Jacobi theory is derived for a classical spinning dipole. This classical theory can be put in a form almost identical with the Pauli spin theory. This theory is quantized by requiring that a classical wave function be continuous and singlevalued, and that it satisfy the usual energy eigenvalue equation. The correct energy levels are derived for a hydrogen atom in an external field. The kernel for the Pauli equation is derived from this classical model and the kernel for the quasi-classical is found. (Author)

PB 154 710 $2.60

University of Southern California. Engineering Center, Los Angeles.
A METHOD OF ANALYZING THE BOLTZMANN EQUATION OF ELECTRONS AND ITS APPLICATION TO PLANE OSCILLATIONS OF ELECTRONS IN A WARM PLASMA, by Toyoki Koga. Technical note on Contract AF 49(638)831. Dec 60, 27p; 2 refs. USCEC rept. 83-203; AFOSR 74; AD-251 076.

DESCRIPTORS: *Electrons, *Mathematical analysis, *Plasma physics, Ions, Statistical functions, Plasma oscillations.

Considering that the mass of an electron is much smaller than that of a heavy particle (ion or molecule), and that the number density of electrons is much smaller than that of heavy particles, the collision term of the Boltzmann equation for electrons is simplified. A method of analyzing the equation is devised by considering the subsidiary equations of the original equation. As an example, a plane oscillation of electrons in a warm plasma is studied. (Author)

Thermodynamics

ANL-6313 $0.50

Argonne National Lab., Ill.
MIXING OF A COLD LIQUID JET WITH A BOILING LIQUID STREAM, by S. G. Bankoff. Rept. on Contract W-31-109-eng-38. 21 Oct 60, 18p.

PB 155 915 $4.60

Army Ballistic Missile Agency, Redstone Arsenal, Ala.
HEAT TRANSFER COEFFICIENT FOR A HORIZONTAL TUBE OF ELLIPTIC CROSS-SECTION IN A CONDENSING MEDIUM, by C. K. Liu (U. of Alabama) 10 Dec 59, 43p. 4 refs. Rept. no. DSD-TM-26-59.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Heat transfer, Pipes, *Boiler tubes, Configuration, Heat exchangers, Vapors, Films, *Condensation, Mathematical analysis.

The thickness of the film condensed around a horizontal refrigerated tube of elliptic cross-section in a saturated vapor is expressed as a function of the angular position on the outside surface of the tube. The local heat transfer coefficient is thereby determined. Based on the results obtained, conclusions are drawn with a view to realizing the optimum heat transfer coefficient. Several other non-circular configurations are also briefly discussed. (Author)

BNL-657 (T-213) $0.50

Brookhaven National Lab., Upton, N. Y.
HEAT TRANSFER STUDY OF COBALT-60 SHIPPING CONTAINER, by L. B. Adler. Progress rept. no. 1. Mar 61, 25p.

PB 171 725 $0.50

Bureau of Naval Weapons, Washington, D. C.
ICE POINT STANDARDIZATION MERCURY-IN-GLASS THERMOMETERS. BuWeps-BuShips Calibration Program. 18 Dec 59, 25p. Secondary Standards Lab. Measurement System Operation Procedure NT-01.

DESCRIPTORS: *Thermometers, *Calibration, Mercury, Freezing, Standardization, Instruction manuals, *Measurement.

The ice point standardization of etched stem mercury-in-glass thermometers is accomplished by immersing the thermometer in a bath of melting ice and air-saturated distilled water in equilibrium contained in a

Dewar flask. A 10-power macroscope is used to observe the position of the mercury meniscus with reference to the lines engraved on the thermometer stem. The average measured value is computed from a series of five readings taken at one-minute intervals. Procedures are included for the inspection and correction of some common thermometer faults; mercury separation, gas bubbles, foreign matter, etc.

PB 171 726 $0.50

Bureau of Naval Weapons, Washington, D. C.
TRIPLE POINT OF WATER STANDARDIZATION 0.0100C. BuWeps-BuShips Calibration Program. 26 Oct 60, 12p. Secondary Standards Lab. Measurement System Operation Procedure NT-04.

DESCRIPTORS: *Thermometers, *Temperature sensitive elements, *Calibration, Water, Standardization, Measurement.

This procedure describes the principles, apparatus, and procedures for standardization of precision resistance or liquid in glass instruments at the triple point of water. The system is also used as an accurate reference junction bath in thermocouple certification. The system consists principally of a triple point of water cell, which is a cylindrical glass container having a re-entrant tube which serves as a thermometer well. The inner glass cell is nearly filled with high purity, gas-free water, and is evacuated and sealed. Insulating material supports the glass cell in a stainless steel jacket and provides thermal and physical protection. A removable cover protects and insulates the top part of the glass cell.

PB 153 965 $7.60

David Sarnoff Research Center, Princeton, N. J.
HIGH TEMPERATURE SEMICONDUCTOR RESEARCH, by J. Blanc, R. Bube and others. Scientific rept. no. 3, 1 June-30 Sep 60, on Contract AF 19(604)6152. 31 Oct 60, 72p. 13 refs. AFCRL TN-60-1148; AD-249 599.

DESCRIPTORS: *Semiconductors, *High temperature research, *Gallium compounds, *Phosphides, Crystals, Arsenides, Lattices, Phase studies, *Thermodynamics, Impurities, Diffusion, Temperature, Electrical properties, Contamination.

The density of GaP was measured to be 4.139 plus or minus 0.008 g/cc. An ingot of GaAs(1-x)P(x) was prepared with x varying from 0.75 to 0.98. Studies showed that As vapor will remove the significant amounts of impurities that are deposited on the quartz surfaces during the sealing of the quartz tube, especially Si and Cu. The diffusion constant of Sn in GaAs was measured between 1069 and 1215 degrees C. GaAs was grown horizontally in a quartz boat coated with a radioactive carbon film. In the presence of appreciable amounts of Cu or Se, the distribution coefficient of Si will increase from 0.1 to 0.5 in the case of Cu, and to 0.8 in the case of Se. Most of the Cu-doped high-resistivity GaAs samples are p-type at room temperature. Those with low resistivity remain p-type under photoexcitation while those with higher resistivity convert from p-type to n-type. High resistivity n-type samples have been prepared, one by copper diffusion and two by horizontal Bridgman growth without doping. Epitaxially grown p-n junctions are dependent on the surface dissociation of the GaAs. Broad area (0.3 sq cm) junctions were made by condensing tin vapor on GaAs and then diffusing the tin into the GaAs. These junctions exhibited excellent electrical characteristics, having sharp Zener type breakdowns at about 15 volts. (See also PB 150 963)

PB 155 772 $13.00

Michigan U. Research Inst., Ann Arbor.
A STUDY OF POOL BOILING IN AN ACCELERATING SYSTEM, by H. Merte, Jr. and J. A. Clark. Technical rept. no. 3 on Contract DA 20-018-ORD-15316. Nov 59, 182p. 64 refs. 2646-21-T.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Acceleration, Thermodynamics, *Boiling, *Heat transfer, Bubbles.

A study is made of the influence of system acceleration (1 to 21 g's) on pool boiling heat transfer in saturated distilled water at approximately atmospheric pressure. As a means for obtaining a theoretical understanding of the process of boiling under the influence of high acceleration including the simultaneous effect of natural convection, a concept of the "Area of Influence" of the bubbles is defined and values calculated for the various accelerations and heat flux rates. The change in $T_w - T_{sat}$ with heat flux and acceleration is used to calculate the influence of heat flux on the number of active nucleating sites.

PB 171 283 $0.75

Midwest Applied Science Corp., Lafayette, Ind.
TRANSIENT TEMPERATURE IN A SEMI-INFINITE, POROUS SOLID WITH PHASE CHANGE AND TRANSPIRATION EFFECTS, by Richard J. Grosh. Rept. on Research on Application of the Theory-Practice of Electric Circuits to the Study of Transients in Thermal Insulation, Contract AF 33(616)5623. Jan 60, 30p. 12 refs. WADD Technical rept. 60-105.

DESCRIPTORS: *Solids, *Temperature, *Thermal insulation, Transients, Circuits, Theory.

Solutions are given for the transient temperature distribution in a semi-infinite solid whose interconnected pores were initially filled with a material which undergoes a phase change, and, because of the resulting change in density, streams or transpires toward the accessible surface. The possibility that several phase changes can occur is considered along with variations in thermal properties from one phase to another. Before the step change in surface temperature, the solid is assumed to be at a uniform temperature. The solutions for the temperature distribution are given in terms of well known, tabulated functions. However, the phase front positions are determined by solving a set of non-linear, algebraic equations. In the case where only one phase change occurs, a nomogram is

presented for solution of the equation. The type of nomogram presented may find application in other types of phase change problems. The total results will be of interest in developing materials for transient high temperature environment conditions. (Author)

PB 171 796 $0.75

Naval Ordnance Lab., White Oak, Md.
THERMODYNAMIC PROPERTIES OF POLYSTYRENE AND STYRENE, by R. W. Warfield and M. C. Petree. 21 Sep 60, 24p. 26 refs. NAVWEPS rept. 7352; AD-252 578.

DESCRIPTORS: *Polymers, *Styrenes, *Thermodynamics, Specific heat, Enthalpy, Entropy, Transition temperature.

A Tarassov function has been used to estimate the specific heat of polystyrene between 0° and 60°K and these data, together with published Cp data, have been used to calculate the entropy, enthalpy, and free energy of styrene and polystyrene from 0° to 298.16°K. Entropy of polymerization of styrene at 298.16°K was found to be 26.69 cal/deg. mole. Changes in the various thermodynamic functions at the glass transition temperature, T_g, are in accordance with the second order transition as defined by Ehrenfest. The thermodynamic function Cp/T vs. T as calculated for polystyrene increases to a maximum at 65°K and then increases again at the glass transition temperature. The Tarassov function, which is shown to be useful in estimating the specific heat of amorphous polymers, should be combined with a T^3 Debye function to yield more accurate Cv data at low temperatures. An approximation is made of the heat capacity at constant pressure per vibrating unit of polystyrene at 273°K. Cp-Cv is calculated at 273°K and found to be 0.019 cal/deg. gm. or 1.98 cal/deg. mole. (Author)

PB 154 574 $2.60

Polytechnic Inst. of Brooklyn, N. Y.
A NOTE ON THE APPLICATION OF THE HEAT BALANCE INTEGRAL TO PROBLEMS OF NON-PLANAR GEOMETRY, by Thomas J. Lardner and Frederick V. Pohle. Rept. on Contract AF 49(638)302. Jan 61, 23p. 11 refs. PIBAL rept. no. 585; AFOSR-57; AD-250 719.

DESCRIPTORS: Cylindrical bodies, Sheets, *Heat transfer, Integral equations, Spheres, Mathematical analysis, *Thermodynamics.

The temperature distribution in the region exterior to a cylindrical hole in the infinite space whose boundary is exposed to a constant heat flux is determined using the integral method with a parabolic profile. The results indicate that the use of the parabolic spatial temperature distribution leads to poor agreement with the exact solution. A modified profile is then introduced and is found to lead to better agreement. In addition, the analogous problem for the spherical cavity is treated. (Author)

PB 171 538 $0.75

Watertown Arsenal Labs., Mass.
DEVELOPMENT OF A TUNGSTEN/MOLYBDENUM IMMERSION THERMOCOUPLE FOR MEASURING MOLTEN METAL TEMPERATURES IN VACUUM, by Philip Wong and Philip S. Schaffer. Feb 61, 22p. 13 refs. Technical rept. no. WAL TR 831.13/1; AD-253 949.

DESCRIPTORS: Tungsten, Molybdenum, *Thermocouples, Design, Liquid metals, Temperature, Measurement, High temperature research, Metals, Controlled atmospheres.

A calibration curve of electromotive force as a function of temperature for a tungsten/molybdenum thermocouple was determined. A graphite crucible was utilized in a vacuum induction melting unit to obtain measurable temperatures up to 3000°F and higher at pressures averaging 3.7 millimeters of mercury. The results obtained in these investigations yielded a calibration curve having a maximum deviation of ±1.67%. A linearity was observed in the range from 2000° - 3000°F. Accurate means of temperature measurement beyond this range were not available. Electromotive force readings of the tungsten/molybdenum thermocouple were obtained as high as 4.9 millivolts corresponding to approximately 4000°F. (Author)

Wave Propagation

PB 154 567 $2.60

Case Inst. of Tech., Cleveland, Ohio.
A NOTE ON WAVEGUIDE IMAGE TECHNIQUES, by R. E. Collin. Scientific rept. no. 19 on Contract AF 19(604)3887. 30 Nov 60, 21p. 2 refs. AFCRL-TN-60-1169; AD-250 931.

DESCRIPTORS: *Waveguides, Propagation, *Wave transmission, Scattering, Reflection, Mathematical analysis, *Electromagnetic waves, *Electromagnetic wave reflections.

Floquet's theorem and the reflection symmetry properties of Maxwell's equations are used to establish the relationship between scattering by two dimensional periodic structures in free space and equivalent waveguide problems. For structures, such as strip gratings, having periodicity in one direction only it is shown that the free space problem is equivalent to the sum of two waveguide problems and vice-versa. For structures with periodicity along two axis it is shown that four waveguide problems must be solved in order to determine the complete solution of the free space problem. Only when more than one basic cell of the periodic structure is contained within the waveguide walls will a single waveguide problem be equivalent to the free space problem as far as dominant mode fields are concerned. (Author)

PB 154 705 $11.00

Stanford Electronics Labs., Stanford U., Calif.
RESEARCH ON POLAR RADIO PROPAGATION BLACKOUTS, by R. D. Egan and A. M. Peterson. Final rept. on Contract AF 19(604)4103; Scientific rept. no. 11 on Contract AF 19(604)2193. 29 Nov 60, 145p. 18 refs. AFCRL-3; AD-251 195.

DESCRIPTORS: *Radio waves, *Propagation, *Arctic regions, *Ionospheric disturbances, Multipath transmission.

A summary is presented of propagation information obtained on five point-to-point circuits during the period from March 1959 through June 1960. These five circuits (with terminals at Thule, Greenland; College, Alaska; Boston, Massachusetts; and Stanford, California) provided an excellent sampling of typical arctic long-distance communication paths---including paths within the auroral zone, outside the auroral zone, along the auroral zone, and across the auroral zone. Signal amplitude recordings at 12 and 18 Mc were made continuously over each of these circuits. The accumulated data are summarized graphically as the number of hours during each day when a useable signal was present on each circuit, along with a comparison with conventional predictions and other descriptive geophysical data. Over-all trends are discussed and compared with similar trends observed in other geophysical phenomena. Gross multipath observations at Stanford during April-June 1960 are also discussed. It is shown that, for communications purposes in the arctic regions, each individual circuit has its own propagation peculiarities and relation to ionospheric disturbances. (Author)
(See also PB 147 360)

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

PB 154 367 $3.60

Army Engineer Research and Development Labs., Fort Belvoir, Va.
ENGINEERING TESTS AND EVALUATION OF A 9- BY 18-INCH ELECTRONIC PRINTER, by Dale E. Howell. Rept. on DA Proj. no. 8-35-03-480, 24 Aug 60, 31p. Technical rept. 1646-TR; AD-246 220.

DESCRIPTORS: *Printing, *Electronic equipment, Photographs, Preparation, Processing, *Aerial photography, *Mapping, Stereoscopic map plotters, Tests.

An electronic printer was tested primarily for determining its suitability for the preparation of 9 1/2- by 9 1/2-inch diapositives for the precision stereoplotter and, in addition, its ability to accommodate 9- by 18-inch format photography. It was concluded that: (a) the LogEtronics Model CP-18-S printer is suitable for the preparation of diapositives for the precision stereoplotter; (b) the printer is also suitable for the preparation of 9- by 9-inch and 9- by 18-inch format single weight paper prints; (c) modification of the printer to change the location of the safelight is necessary; the remaining modifications, as discussed, are desirable; (d) an electronic technician is needed for the performance of electronic maintenance; (e) service testing of the printer is not necessary; and (f) the printer is considered suitable for issue to field topographic organizations after the modification discussed in the report is made. (Author)

PB 171 723 $0.50

Bureau of Naval Weapons, Washington, D. C.
MASS IN AIR 1 MILLIGRAM TO 200 GRAMS. BuWeps-BuShips Calibration Program. 3 Sep 59, 26p. Secondary Standards Lab. Measurement System Operation Procedure NM-01.

DESCRIPTORS: *Weights (Analytical), Calibration, *Weighing, *Balances, Sensitivity, Air, Instruction manuals, Corrections, Measurement.

The measurement system utilized in this procedure consists of the Ainsworth Model TC-M2 analytical balance, class S standard and tare weights. The Test Instrument is placed in the right-hand pan and counterbalanced with tare weights in the left-hand pan. A mean-of-swings rest point (center of oscillation of the pointer) is determined from turning point readings. A one milligram sensitivity weight is then placed on the lighter pan and another mean-of-swings rest point determination is made. Using these data, the sensitivity of the balance in milligrams per scale division is computed. The sensitivity weight is then removed and a standard weight substituted for the Test Instrument. A mean-of-swings rest point is again determined. The mass of the Test Instrument can then be computed from the certified value of the standard weights and the effective value of the change in rest points.

PB 154 557 $4.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
COMPUTERS IN AUTOMATIC CONTROL SYSTEMS, by John G. Truxal. Rept. on Contract AF 18(603)105. 9 Nov 60, 43p. 11 refs. Research rept. PIBMRI-879-60; AFOSR-TN-60-1475; AD-251 128.

DESCRIPTORS: *Automatic, *Control systems, Electrical equipment, Design, Switching circuits, Theory, *Computers, *Digital computers.

Modern automatic feedback control systems increasingly utilize flexible and highly developed electronic computers as active controllers. The trend from the use of simple electric circuits and elementary analog devices toward high-speed digital computers (or computers employing both digital and analog devices) is accelerated by: (1) the rapidly growing complexity of modern control systems; (2) the development of optimizing control; and (3) the increasing importance of self-adaptive control. Recent applications of computer control include the automatic control of boiler operation in an electric generating station, the adaptive autopilots for piloted aircraft, and the automatic control of load dispatching in electric power distribution. (Author)

PB 147 752 $4.60

Stanford Electronics Labs., Stanford U., Calif.
A PARTIAL ORDERING FOR BINARY CHANNELS, by N. M. Abramson. Rept. on Contract Nonr-225(24). 15 Apr 60, 42p. 7 refs. Technical rept. no. 2001-1; AD-237 640.

DESCRIPTORS: *Data transmission systems, *Probability, *Communications theory, Information theory, Statistical analysis, Games theory, Mathematical analysis, Matrix algebra.

The properties of iterated binary channels are investigated. An ordering (defined by the symbol $\supset$) of communication channels with two possible inputs and any number of possible outputs is defined. For any two such channels C_1 and C_2, this ordering has the property that if $C_1 \supset C_2$, the minimum average loss when using C_1 will be less than the minimum average loss using C_2 independent of the losses assigned to the various errors, and independent of the statistics of the source. This ordering is applied to: (a) the general binary channel, (b) the iterated binary symmetric channel and (c) the unreliable binary symmetric channel when used with many iterations. Curves allowing one to use the ordering are given and an example using these curves is worked out. (Author)

PB 147 556 $4.60

Syracuse U. Research Inst., N. Y.
DEVELOPMENT OF MULTIDIMENSIONAL INFORMATION THEORY. PART 1, CHAPTER 1. FIGURE MEASURES, ESPECIALLY LINE MEASURES, by Walter R. Baum. Technical rept. on Contract Nonr-669(10). 25 Apr 60, 44p. 8 refs. SURI rept. no. EE494-604TR; AD-236 921.

DESCRIPTORS: *Information theory, *Measure theory, Communication theory, Groups (Mathematics), Transformation (Mathematics).

The concept of source in information theory is considered. A certain type of probability space is constructed so that it becomes possible to attack, by information theory, certain problems which are too difficult using the usual mathematical models of source (sink) and channel. The difficulty is overcome by introducing a suitable concept of multidimensional source, into which a structure set of transformations is incorporated. Incorporation means that the probability (measure) underlying the source (probability space) is defined relative to a structured set (usually a group) of transformations acting transitively on the space of the source. This is presented partially in geometric language, using the concept of geometric figure as an intuitive and convenient means to express the combination of a set of parameters and a set of relations between them.

SOCIAL SCIENCES

PB 154 122 $1.10

Applied Mathematics and Statistics Labs., Stanford U., Calif.
ON THE FORMATION OF PRICES, by Takashi Negishi. Technical rept. no. 81 on Contract Nonr-225(50). 6 Apr 60, 9p. 8 refs. AD-235 565.

DESCRIPTORS: *Economics, Commerce, Economic conditions, Statistical analysis.

This note discusses the stability of the indeterminate equilibrium. The stability under the assumption of gross substitutability is shown and a case in which a social utility function exists is treated. Because the equilibrium prices cannot be specified beforehand, the discussion of the stability is necessarily a global one.

Documentation

PB 154 228 $17.00

Armour Research Foundation, Chicago, Ill.
FEASIBILITY STUDY. VIDAT MODIFIED CORE SUBSYSTEM I, by S. Hori. Final rept. 1 July-30 Sep 60, on Contract AF 29(600)2484. Oct 60, 267p. 81 refs. ARF rept. no. 5143-4; AFMDC-TR-60-34; AD-250 039.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Data processing systems, Transducers, Reliability, Instrumentation, Data storage systems, Configuration, Errors, Anthropological data, Physiology.

A study was conducted to determine the feasibility of portions of a viability data acquisition, handling, storage, reduction, display and recall system (VIDAT System I). The study included the gathering of data on the data acquisition components and the data handling equipments, the performance of reliability and error analyses, the determination of the system configuration and methods for simulation and calibration, and development of harness and transducer attachment concepts. The feasibility was proved (with minor exceptions) and recommendations for components and equipments are made. Recommendations for continuation include design, construction and test of the Core Subsystem (that portion of system studied plus the display), and a research program intended to provide a basis for the Computer-Recall development. (Author)

PB 154 763 $3.60

System Development Corp., Santa Monica, Calif.
METHODOLOGY NOTE: ON THE DESIGN AND REDESIGN OF SYSTEMS, by B. R. Wolin. Rept. on Contract AF 19(604)2635. Nov 59, 37p. SDC Field note 2600; AFCRC TN-59-70; AD-230 585.

DESCRIPTORS: *Data processing systems, *Computers, Automation, Design, *Operations research, *Coding, *Data storage systems, *Data transmission systems, *Personnel, Digital computers, Tracking.

Open-ended Terms: Sage.

This note discusses some characteristics of complex, man-computer information processing systems and an approach to the design and improvement of such systems.

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U. S. DEPARTMENT OF COMMERCE FIELD OFFICES

SERVE THE BUSINESS COMMUNITY

The Department of Commerce maintains Field Offices to enable the business community to avail itself locally of Government facilities designed to promote commerce. Working closely with various units in the Department and, when necessary, with other Government agencies, the Field Offices provide business services to manufacturers, wholesalers, retailers, trade publications, trade associations, advertising agencies, research groups, financial institutions, and exporters and importers.

Experienced personnel will gladly assist in the solution of specific problems, explain the scope and meaning of regulations administered by the Department, and provide practical assistance in the broad field of domestic and foreign commerce. Field offices act as official sales agents of the Superintendent of Documents, and maintain an extensive business reference library containing periodicals, directories, publications and reports from official as well as private sources.

Among the many services which businessmen have found of value are:

GENERAL

- Management and business aids
- Establishing a new business

BASIC ECONOMIC DATA

- Census data, with national and often State and regional breakdowns, on manufacturing, wholesaling, retailing, service industries, employment and unemployment, population, housing, agriculture
- Basic records of national income and product, regional trends, balance of payments, foreign aid

MARKETING AND DISTRIBUTION

- Development and maintenance of markets
- Distribution channels, facilities and services
- Marketing and distribution statistics

PRODUCTION

- Modernization of plant processes and other technological aids
- Development of new products
- Government-owned patents for free license
- Commodity standards

FOREIGN TRADE AND INVESTMENT

- Tariff and exchange regulations
- Import and export quotas, licensing regulations
- Statistics on imports and exports
- Investment and trade opportunities abroad
- Economic conditions in foreign countries

COOPERATIVE OFFICES

To make the services of the Department of Commerce more widely available, agreements have been entered into with more than 750 Chambers of Commerce, Manufacturers Associations, and similar business groups under which these organizations have become official Cooperative Offices of the Department. If specific information is not on hand in the Cooperative Office, your problem will be referred to the nearest Departmental field office.

Department Field Offices

ALBUQUERQUE, N. MEX., U.S. Courthouse.
ATLANTA 3, GA., 604 Volunteer Bldg.
BOSTON 10, MASS., Room 230, 80 Federal St.
BUFFALO 3, N.Y., 504 Federal Bldg.
CHARLESTON 4, S.C., Area 2, Sergeant Jasper Bldg., West End Broad St.
CHEYENNE, WYO., 207 Majestic Bldg.
CHICAGO 6, ILL., Room 1302, 226 W. Jackson Blvd.
CINCINNATI 2, OHIO, 809 Fifth Third Bank Bldg.
CLEVELAND 1, OHIO, Federal Reserve Bank Bldg.
DALLAS 1, TEX., Room 3–104 Merchandise Mart.
DENVER 2, COLO., 142 New Customhouse.
DETROIT 26, MICH., 438 Federal Bldg.
GREENSBORO, N.C., 407 U.S. Post Office Bldg.
HOUSTON 2, TEX., 610 Scanlan Bldg.
JACKSONVILLE 1, FLA., 425 Federal Bldg.
KANSAS CITY 6, MO., Room 2011, 911 Walnut St.
LOS ANGELES 15, CALIF., Room 450, 1031 S. Broadway.
MEMPHIS 3, TENN., 212 Falls Bldg.
MIAMI 32, FLA., 408 Ainsley Bldg.
MINNEAPOLIS 1, MINN., 304 Federal Bldg.
NEW ORLEANS 12, LA., 333 St. Charles Ave.
NEW YORK 1, N.Y., Empire State Bldg.
PHILADELPHIA 7, PA., Jefferson Bldg.
PHOENIX, ARIZ., 137 N. Second Ave.
PITTSBURGH 22, PA., 107 Sixth St.
PORTLAND 4, OREG., 217 Old U.S. Courthouse and P.O. Bldg.
RENO, NEV., 1479 Wells Ave.
RICHMOND 19, VA., 309 Parcel Post Bldg.
ST. LOUIS 1, MO., 910 New Federal Bldg.
SALT LAKE CITY 1, UTAH, 222 SW. Temple St.
SAN FRANCISCO 11, CALIF., Room 419 Customhouse.
SAVANNAH, GA., 235 U.S. Courthouse and P.O. Bldg.
SEATTLE 4, WASH., 809 Federal Office Bldg.

For local telephone listing, consult section devoted to U.S. Government

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